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Uncle Sam's Greatest Navy Yard

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The growth of naval activity during the war is exemplified by the expansion of the manufacturing facilities of the Philadelphia Navy Yard, better known of old as "League Island." During the past two and one-half years over $25,000,000 were expended in its development, this being approximately double the total previous cost for the sixty years of its existence up to June 30, 1916. And the end is not yet.

THERE is nearly always abroad in this land of ours a certain steady murmur of criticism against projects involving any considerable expenditure of public funds. Sometimes this criticism is directed toward the worth or worthiness of the project itself, but more often against the quality and quantity of the return obtained by the Government for its money. Criticism of this latter sort has been particularly rampant during and since the war, and it may therefore be refreshing and just as well for variety's sake, if for no other reason, to mention briefly at least one conspicuous instance where the Government has obtained full worth for its money, and where the resulting plant is one that even so great a nation as our own may well feel proud to possess.

The Philadelphia Navy Yard has grown during the war to be incomparably the greatest naval station of the United States. This fact is not known or appreciated even by the citizens of Philadelphia, owing to certain war-time restrictions still prevailing, preventing access to the yard by the general public. In all the sixty years since the establishment of the yard up to June 30, 1916, the total expenditures for improvements had only been $13,700,000. During the last two and a half years over $25,000,000 has been spent in enlarging and developing the facilities of this great shipbuilding and repair plant, and to those familiar with this, or indeed any of our major naval stations before the war, it will seem, when seen again, entirely transformed. The old structures, the little group of red-brick shops and offices, the wooden residences, formerly constituting what was considered a large navy yard, are now quite dwarfed by the many new ones that have been erected, and the completed project will aggregate $35,000,000.

The main street of the city, Broad St., passes through the center of the yard and to the east and west of it the built-up area now extends for a mile in either

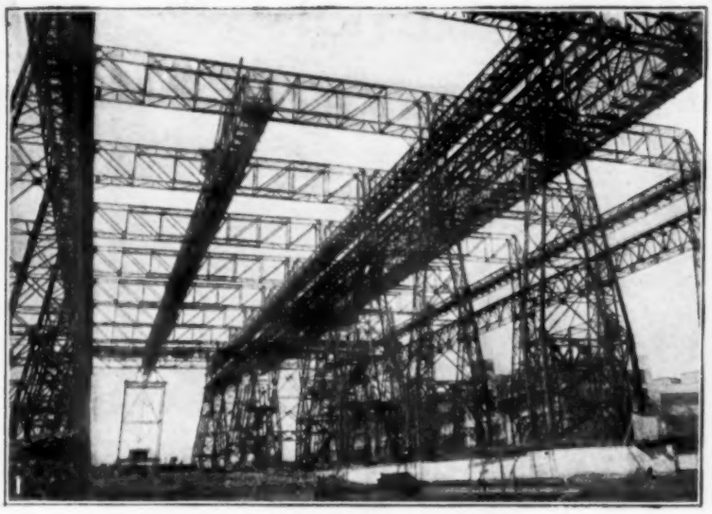


FIG. 1. THE TWO STEEL SHIPWAYS

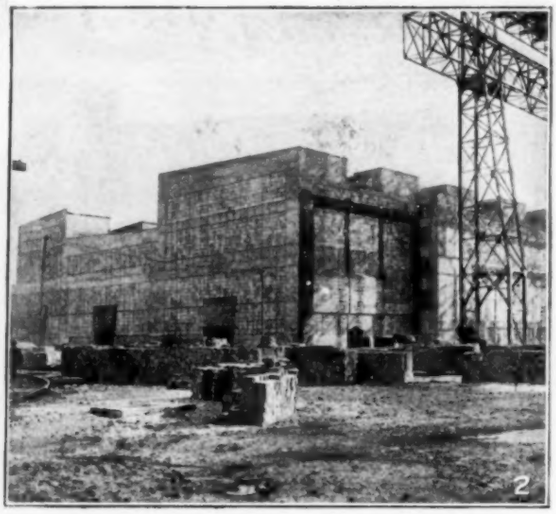


FIG. 2. NEW STRUCTURAL IRON SHOP

direction, where before the war it was limited to one or two blocks either way. Where forty vessels formerly represented the maximum number tied up to its piers there are now more than one hundred and forty vessels there.

The only way to get a real idea of the magnitude of the plans on which the yard is constructed is to take a trip in a Navy "blimp" or seaplane. Looking west along the Delaware River waterfront one sees the "fitting-out" pier, a structure 1,000 ft. long, 100 ft. wide with 35 ft. of water at mean low water—easily the longest and finest pier on the river. Its cost was $785,000. At the outer end of this pier great concrete caissons resting on footings sunk to a depth of 75 ft. sustain the massive weight of the huge crane named "The League Island." This crane is a dominant landmark on the river front, towering higher than an 18-story building and capable of lifting a 14-in. turret, with its guns in place, out of a battleship and placing it if necessary at a height greater than that of the Brooklyn Bridge. An idea of the strength and capacity of this million-dollar lifting device, the largest crane in the world by more than 100 tons, is afforded by the fact that on test it lifted a load of 440 tons and swung it over more than a 100-ft. radius (see headpiece). It will also handle 50 tons at 190 ft. from center. Its cost was approximately $850,000.

Continuing westward along the river front we see something of the big scale of what may be called "The New Yard," which is to be devoted primarily to shipbuilding. The new drydock, now in process of construction and about 60 per cent complete, much resembles a section of the Panama Canal. Its depth and width are equal to the locks of that great waterway, and the railroad tracks along the top, the concrete-mixing plants, derricks, cranes, shovels and chutes all help to heighten the impression. This drydock will take any ship that can pass through the locks of the Panama Canal; that is, a vessel 1,600 ft. long, 110 ft. beam with 43½ ft. over the sill at mean high water. It is being constructed under unusually adverse conditions, owing to the large amount of water encountered in the excavation. It has been necessary to inclose the dock in a box of sheet-steel piling with intermediate cross-walls to keep the water out. The dock contains 200,000 cu.yd. of concrete. The pump well is 200 ft. long and 50 ft. wide with a depth below the ground of 90 ft. The cost, including two 50-ton traveling dock cranes, will be $6,500,000. The only other drydocks of equivalent dimensions are the ones at Boston, Norfolk, Panama and San Francisco.

Still further to the west are the two new steel shipways, shown in Fig. 1, as large as any of their kind in the world, intended as they are for the building of two of the great battle cruisers upon which work is about to begin. These cruisers, 875 ft. long overall, will be about 25 per cent longer and heavier in displacement than any vessels ever before constructed in this country. The extreme height of the steel superstructure of these building slips above the ground is 180 ft. Each slip is provided with 10-ton cranes spanning half the width of the slip and a 40-ton crane spanning the entire slip. The crane rails for 40-ton cranes are 135 ft., and for the 10-ton cranes, 152 ft. above the ground. The crane-runway superstructure is now being extended to its full length of 1,000 ft., and a light crane runway will be carried out over the ground at the head of Slip No. 3, to handle bulkheads and other fabricated material. The cost of these slips with crane runway extension, including keel blocking, will be $2,800,000.

Alongside of these slips extend the glass walls of the new structural iron shop, Fig. 2, a building 700 ft. long and 300 ft. wide and including a structural shop and smithery. The most westerly bay has a second story to provide a mold loft 700 ft. long and 100 ft. wide. Material will come in at the waterfront end, pass through the shop and go out at the north end, directly to the shipbuilding ways. The cost of the building and cranes was $1,835,000; machine-tool equipment and foundations, $955,000—a total of $2,790,000.

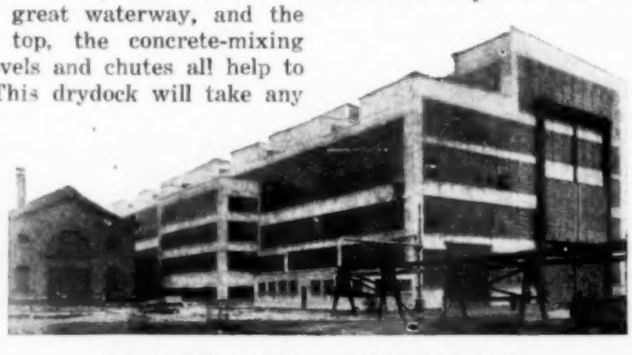


FIG. 3. NEW MACHINE-SHOP BUILDING

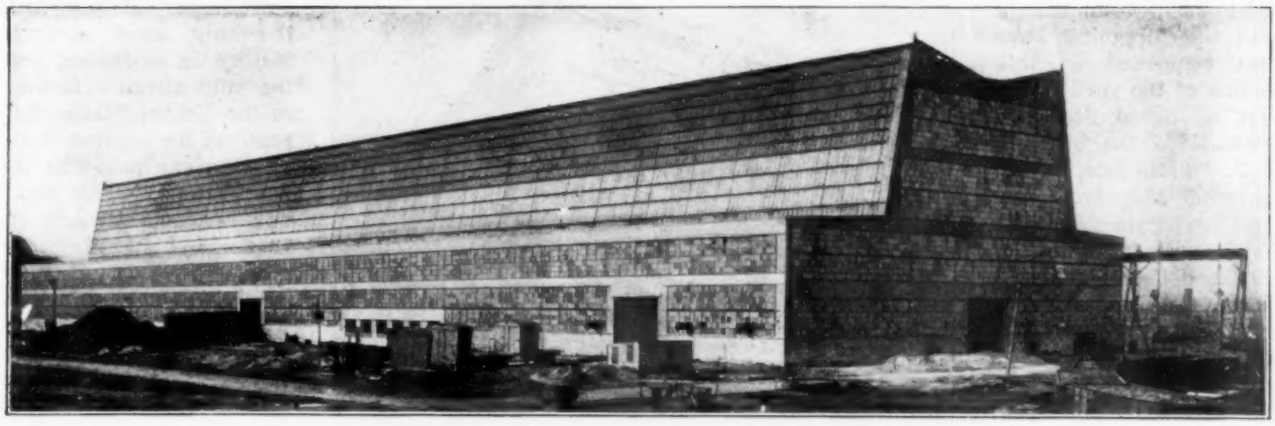


FIG. 4. THE NEW FOUNDRY

Laid back slightly from the waterfront and directly at the inshore end of the fitting-out pier is the new machine shop, Fig. 3. This building is 325 ft. long and 130 ft. wide, with a main bay 80 ft. in width and a height of 70 ft. to crane rails. It is designed for two 150-ton traveling cranes, but at present is equipped with only one such crane. The cost of the building and cranes was $660,000; tools and foundations, $425,000—a total of $1,085,000. The complete project includes a 350-ft. extension of the building toward the waterfront, with one additional 150-ton crane. This shop can then handle all the large machine work of capital-ship construction.

Not far away is the new foundry, Fig. 4. This building is 642 ft. long and 160 ft. in width, with a central bay of 80 ft. designed for two 80-ton cranes with a height of 63 ft. to crane rails. At the present time one 80-ton crane is installed. The cost of the building and cranes was $1,150,000; furnaces and equipment, $300,000—a total of $1,450,000.

This foundry can produce steel castings weighing 5,000 lb. and iron castings up to 200,000 lb. Additional equipment for the melting of steel is to be provided, and such castings up to 20 tons, required in the erection of a capital ship, will be produced in this foundry.

To the west of the foundry an entire new power plant, Fig. 5, has been constructed to meet the increased demands for power which will be occasioned by the construction of capital ships, the operation of the new dock and the existing and projected general development of the yard. This is a plant of the most modern type, with adequate capacity to meet the needs of the yard for various power services. Many new devices for speeding up production are available here, one of the novelties being a double-action coal chute and conveyer that empties the contents of a carload of coal, crushes it, and carries it up on to belt conveyors into a concrete hopper of 2,200 tons' capacity whose contents will be fed automatically to the furnaces below. When equipped to its full capacity, the plant will have a nominal boiler-horsepower of 9,600 or 19,200 hp. at 200 per cent rating, 29,000 cu.ft. per minute of compressed air and 12,000 kw. of electrical energy. A coal-storage plant to the west of the power house is capable of storing in excess of 10,000 tons. Funds already provided for this plant, including coal storage, but not including the power distribution systems connecting the plant with the various shops, piers, etc., aggregate $2,800,000.

To the east of the foundry is a new three-story concrete building, now in process of erection, for the new pattern shop and pattern storage. This building is 400 ft. long, 108 ft. wide, and, when completed, will cost about $750,000.

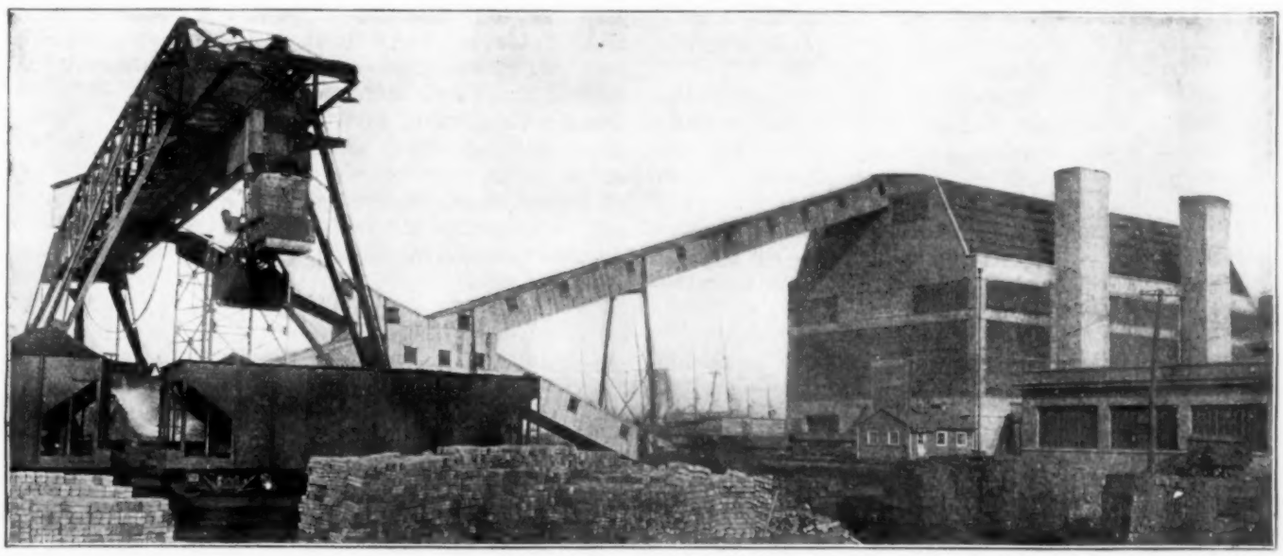


FIG. 5. POWER PLANT WITH COAL AND ASH CONVEYOR

Various other structures of lesser importance than the foregoing have been completed in this portion of the yard to the west of Broad St., each essential to the building of a first-rate, fully equipped shipyard; and the aggregate cost of which will total several million dollars. Among these should be mentioned two small shipways costing $75,000, from which four mine sweepers, steel vessels 190 ft. in length, have been successfully launched and completed; a galvanizing plant; an acetylene plant, and a locker building adjacent to the new structural shop, costing $270,000; a stowage yard, costing $150,000, for 40,000 tons of steel for battle-cruiser material; a charging station for submarines and a permanent storage-battery building, costing about $200,000; a new boat shop, costing $380,000; a new roundhouse, costing $80,000; and various temporary buildings, costing $525,000, with a total floor area of 800,000 sq.ft. to accommodate the enormous quantities of stores handled during the war and the material removed from the many ships being placed out of commission and in reserve.

FIG. 6. ONE OF THREE PERMANENT STOREHOUSES

East of Broad St. the improvement is no less notable. On what were formerly drill grounds, fields and mosquito swamps there are now storehouses, hospitals, barracks, aircraft factory, etc. Some idea of the storehouse problem at this yard may be gained from the statement that the value of material stored here, exclusive of aircraft material, is over $50,000,000. Three large modern reinforced-concrete storehouses, Fig. 6, thoroughly fireproof, with a floor area of over 1,000,000 sq.ft., have been erected at a cost of $2,500,000.

The buildings of the concentration camp, erected at a cost of $1,650,000, provide accommodations for 6,000 men and constitute, with their roads and boardwalks, a little "city" within the yard, complete in itself.

The new hospital, costing $1,040,000, consists of a number of neat-looking gleaming white concrete buildings having a capacity of 1,000 beds.

Readers of the *American Machinist* have already enjoyed reading of the truly remarkable performance of the naval aircraft factory at this yard, the only *naval* aircraft factory in existence, and the only aircraft factory in the United States that received no adverse criticism in the post-war investigations. The plant was started in August, 1917, and within two months from the time of commencement of the work machinery was in actual operation. The original factory has been greatly expanded and at this time the entire plant includes 21 acres under roof. The first flying boat produced by this factory was actually in the air four months from the time ground was broken. Up to the time of the armistice, 187 flying boats or seaplanes had been assembled, representing a value of $4,500,000. The cost of the plant improvements aggregates $5,775,000, or a total, with machine-tool equipment, of $6,150,000.

In addition to many other structures, such as garages, reservoirs, roundhouse, dispensary and the new radio towers, Fig. 7, there have been added to the yard power-distribution systems for the distribution of electrical energy, compressed air, steam, fuel oil, city reservoir water and Delaware River water, sewage and drainage. Many new streets have been made; old streets widened and repaved; railroad trackage more than quadrupled; many additional locomotives, cranes and motor trucks have been purchased to supplement the transportation equipment.

The grass plots, lawns and flower beds that formerly made the yard a sort of park, have almost disappeared, and this great inland naval station has come into its own. So busy are the streets and avenues that at many of the crossings sailors act as "traffic cops," and the total number of inhabitants of the yard during the day, counting all employees and the sailors and marines on ships and in barracks, is not far from 40,000. The yard has thus been converted into a veritable "naval city," but where formerly the warships were the chief points of interest, now the shops and equipment have become the chief attraction. Though warships of all types, sizes and ages are berthed at its docks, they are merely incidental, from the visitor's point of view, to the vast industrial expansion resulting from the war.

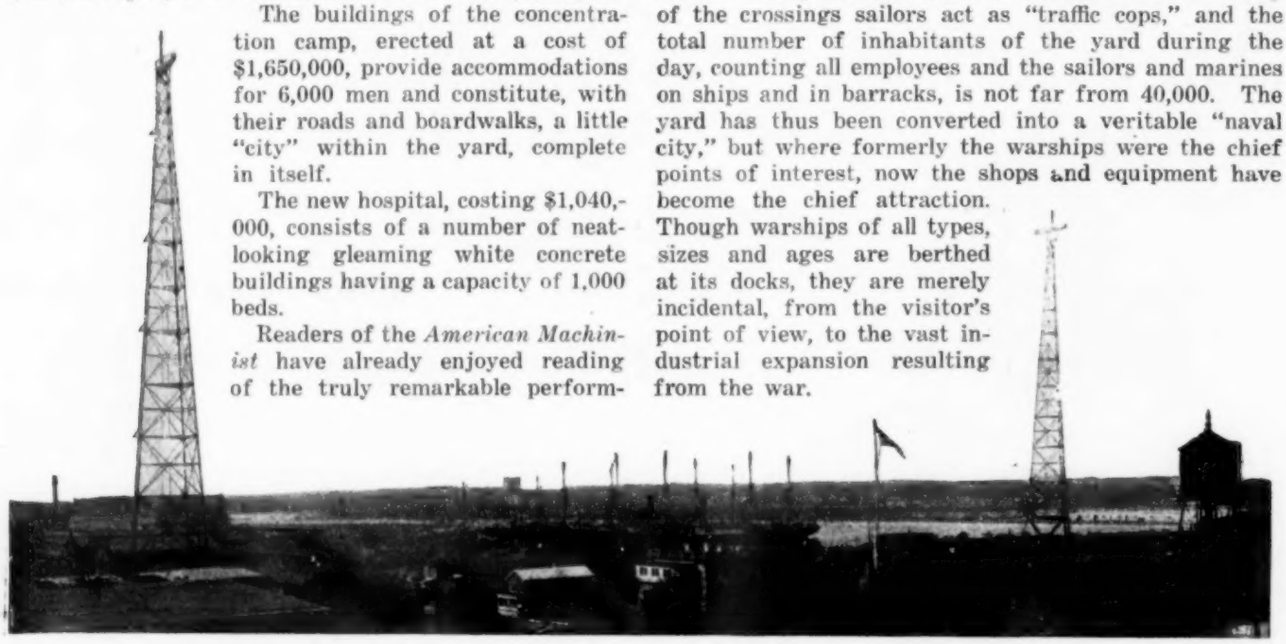


FIG. 7. THE RADIO TOWERS

Brazing Steel Tubes and Sheets

EDITORIAL CORRESPONDENCE

Credit for the information contained in this article belongs to F. Grotts, chief metallurgist of the Curtiss Aëroplane and Motor Co. It is the result of a large number of experiments, together with his practical experience in handling these materials in every-day work. The data cannot fail to be of value to all having similar problems.

ALTHOUGH both electric and oxy-acetylene welding have made great strides within the past few years, there still remains a field for brazing in certain kinds of work. Airplane manufacturers favor it for many of the fittings, because of the lower temperatures which can be employed and the decreased danger of injuring the material by overheating.

Two brazing materials are used; one having an analysis of 80.0 per cent copper, 9.3 per cent lead, 0.1 per cent iron, 1.25 per cent impurities, and the remainder something over 18 per cent zinc. The other brazing material has from 58 to 60 per cent copper and the remainder zinc. The first material, containing 80 per cent copper, is preferable, as when this is used the steel can be treated afterward without inquiry to the brazed joints.

Brazing vs. Welding or Soldering

Brazing, as distinguished from welding or soldering, may be said to be the joining of two pieces of higher fusing metals, such as iron, steel, or copper, by the use of a lower fusing copper-zinc alloy; although in the case of iron or steel parts, pure copper is sometimes used. The parts to be joined are heated a little above the fusing point of the brazing metal, while a flux, such as borax, which will fuse and dissolve all the metallic oxides present, is used with the brazing metal so that the metal melts and runs into the places where the union of parts is desired. The parts are then allowed to cool in air, after which the joint is finished by removing the adhering flux and superfluous brazing metal.

Brazing is also referred to as "hard soldering," in distinction from soft soldering, in which a tin-lead alloy is used. The use of silver solder is also called hard soldering in some places, although it should be referred to as silver soldering.

The brazing metal or the metal which is used for forming the joint is often called spelter, particularly when it has a low copper content. This, however, should never be less than 55 per cent copper, as any further reduction greatly weakens the alloy. The ultimate strength of a brazed joint depends on the strength of the brazing metal forming the union. The stronger the brazing metal that can be used the stronger will be the joint.

The most satisfactory fluxes for brazing with a copper-zinc alloy are borax and boric or boracic acid. The latter is to be preferred because it contains no water of crystallization and melts without foaming or frothing. Borax contains a large amount of water of crystallization, and as this is driven off in the first heating it is apt to froth violently, causing the flux to be blown off by the torch or flame. Unless a flux is used which instantly dissolves the oxides as they form on the metal, the brazing metal will not flow freely, interfering greatly with the securing of a good joint.

Copper and brass have the peculiarity of dissolving their own oxides, and this interferes with the flow of the metal. Brazing spelter should be clean metal; that is, free from dissolved oxides and impurities in suspension.

Experiments indicate that the iron content can be considerably higher than 0.1 per cent without damage. But although percentage of allowable impurities appears high, brazing by the acetylene torch, with metal containing 83 per cent copper, showed a greater tensile strength in a number of cases than the steel which was brazed. Pure copper is inferior to good brass as a brazing metal. It requires a considerably higher temperature, with increased labor and danger of burning the steel. It does not flow as well as brass and the finished joint is weaker.

One of the main things in making a good brazed joint is to have the parts hot enough so that the brazing metal flows freely, but not sufficiently hot to burn the metal. This requires special care in the use of the acetylene flame, particularly with light-gage tubing. Cases have been found in which the tubing was melted through and the hole covered with brazing spelter. On the other hand, if the temperature is not high enough the brazing metal forms a coarse, granular and brittle structure which makes a weak joint. By taking more time in heating, good results can be obtained.

Acetylene Flame Best

In all the experiments made, the strongest joint was produced by the acetylene flame; the gas fire was next, and the dip-brazing method proved the weakest. This was, no doubt, due to the fact that, as dip brazing is ordinarily practiced, the steel does not become any hotter, and probably not as hot, as the molten brazing metal. Dip brazing should therefore be used only for joints in which there are large surfaces in contact, such as the reinforcement of tubing and similar construction. The average increase in strength of acetylene-brazed joints over fire-brazed joints was 8½ per cent.

Steel parts to be brazed should be free from any adhering foreign matter and from scale. The ordinary film of oxide does no harm. The sandblast should not be used for cleaning, as the rough surface which it produces greatly interferes with the flow of spelter, and, in the effort to overcome this, the workmen may easily overheat the steel, which results in cracks and unsatisfactory joints. Pickling with acid is also unsafe; it is difficult to remove the last traces of acid so completely as to prevent subsequent corrosion.

Cleaning a brazed joint involves removing the black iron oxide or scale, the fused borax, and the excess spelter. The sandblast is perfectly satisfactory for this work, except where more brazing must be done afterward. For removing excess spelter a small electric or pneumatic hammer, fitted with suitable chisels, will do a better job than filing. Abrasive belts, properly arranged, can do most of the work of polishing after excess spelter has been removed. The borax can be

removed with a hot solution of carbonate of soda, which has no bad effect upon either brass or steel.

The effect of the temperature required in the brazing process is to anneal the steel to which it is applied. If the steel has been tempered or hardened by such cold working as rolling or drawing, brazing will reduce its tensile strength and increase its ductility.

Experiments with Brazed Joints

The tables show the results of a series of experimental joints made with different brazing metals, the acetylene torch being used for heating. The flux was a mixture of five parts boracic acid and two parts borax, mixed to a paste with water and applied wet to cold metal, and with zinc chloride used in a similar way. Table I gives the resulting tensile strength. The weakness of the work using the zinc chloride can at least be partly attributed to the fact that the flow of brazing metal was very poor, so that the joints were only partly covered.

TABLE I. STRENGTH OF BUTT-BRAZED JOINTS

Exp. No.	Brazing Metals	—Boric Acid Flux— Load	Lb.Sq.In.	Zinc Chloride Flux Load	Lb.Sq.In.
1	Wire 116-1	6,840	31,500	2,590	11,900
2	Wire 116-2	6,410	29,500	3,070	14,100
3	Wire 116-3	7,650	35,000	1,900	7,700
4	Wire 116-4	6,760	31,000	3,170	14,400
5	Wire 116-5	6,880	31,750	3,000	13,800

Table II shows the results of brazing with different metals, also using the acetylene torch.

TABLE II. RESULTS OF BRAZING WITH VARIOUS METALS

Exp. No.	Brazing Metal	Load	Lb.Sq.In.
6	Brass No. 128-1	5,990	25,500
7	Brass No. 126-2	6,170	28,400
8	No. 128-3	6,220	28,600
9	Copper and brass equal parts	6,790	31,300
10	Copper 2 pt. Brass 1 pt.	7,050	32,500
11	Copper, sheet	6,870	31,800
12	Scrap end brass	670	3,090
13	Spelter (condemned)	9,080	41,800

Table III shows the result of brazing in a gas fire, using sheet copper, while Table IV shows the joint secured with an acetylene torch, with three different silver solders.

TABLE III. RESULTS OF BRAZING IN GAS FIRE WITH SHEET COPPER

Exp. No.	Metal	Load	Lb.Sq.In.
22		7,300	33,700
23		6,500	29,800
24		8,190	38,200
25		7,650	35,200
26		8,650	39,800
27		2,800	21,000
Average		7,180	33,200
28	116-1	9,370	43,100
29	116-2	6,980	32,100
30	116-Soft	10,550	47,500
31	116-4	9,700	44,600
32	116-5	10,970	50,500*
33	128-3	10,690	49,300
34	11-Tobin	10,720	49,400
35	10-Soft	10,990	50,000*

* Steel parted.

The joints brazed in the gas fire, using copper-zinc alloys, with boric-acid flux, nearly all exceeded the maximum strength of the steel used. With copper-zinc brazing alloys, boric acid leaves little to be desired as a flux. It makes no difference how it is applied as long as a sufficient amount is fused on the joint to insure a complete cleaning of the metal.

TABLE IV. TEST OF JOINTS MADE WITH SILVER SOLDER

Exp. No	Metal	Load	Lb. Sq.In.
36	Silver No. 1	8,590	39,500
37	Silver No. 2	10,020	46,000
38	Silver No. 3	11,561	53,200*

* Steel parted.

The effect of heat-treatment on brazed joints shows some interesting results. The bars tested were ½-in. hexagon steel and were butted together for brazing, in order to test the tensile strength of the joints. One-half of the bars were heat-treated by heating to 1,600 deg. and quenching in oil, after which they were reheated to 900 deg. before testing.

The brazing metal used was made by melting together 6 lb. of copper and 1½ lb. of zinc, under a borax flux, and allowing the mixture to cool in the crucible. This ingot was then sawed in two, and one of the halves remelted and poured into a bar. Tests of each half showed as follows:

	Copper	Zinc	Iron	Bismuth	Lead
Ingot	81.74	18.20	0.06	Trace	Trace
Bar	82.60	17.30	Trace	Trace	Trace

This indicated that the zinc decreases with subsequent melting and also that the iron practically disappears.

The tensile strengths are shown in Tables V and VI, which show that the torch brazing is considerably stronger than that made in a gas fire. Heat-treating increases the strength of the joint over 5,000 lb. per square inch for the welds made with the torch, while the joint which was brazed in the fire was only increased 750 lb. per square inch.

TABLE V. STRENGTH OF COPPER-ZINC BRAZED JOINTS

Exp. No.	—Torch Braze— Load	Lb.Sq.In.	Exp.No.	— Fire Braze — Load	Lb.Sq.In.
39	10,390	47,500	45	7,150	32,900
40	7,800	35,800	46	9,610	43,200
41	9,070	41,700	47	9,470	43,600
42	10,390	27,500	48	11,280*	51,500
43	6,880	40,000	49	7,150	32,900
44	10,420	48,000	50	7,860	36,200
Average		43,416	Average		40,050

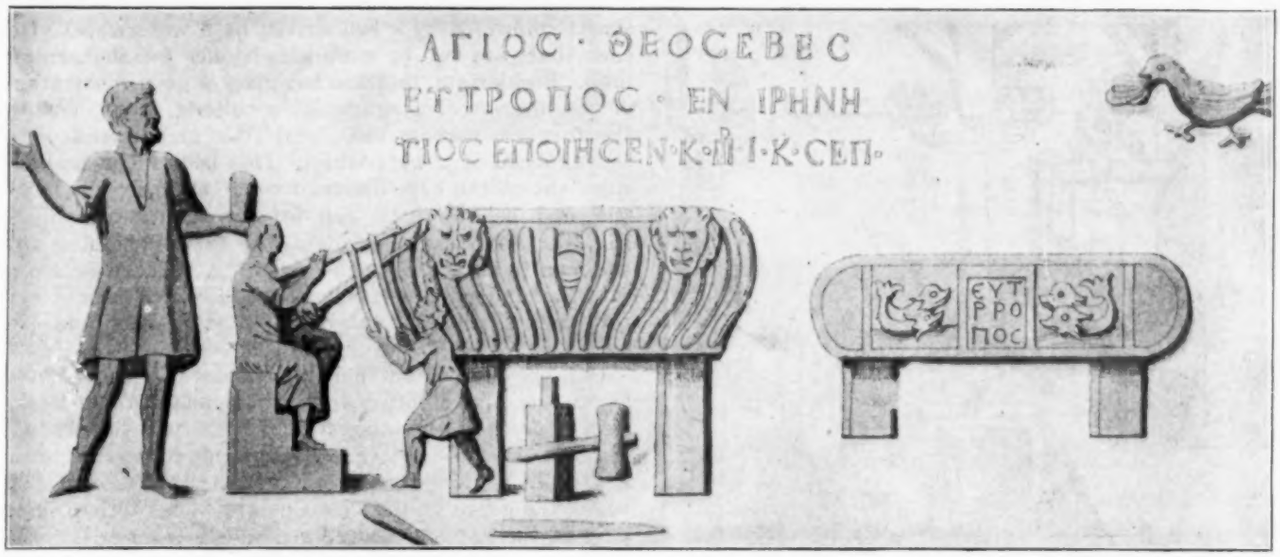
* Steel parted.

TABLE VI. EFFECT OF HEAT-TREATMENT ON BRAZED JOINTS

Exp. No.	— Torch Braze — Load	Lb.Sq.In.	Exp. No.	— Fire Braze — Load	Lb.Sq.In.
51	10,280	47,400	57	9,130	42,000
52	12,220	56,100	58	8,580	39,500
53	10,980	50,500	59	8,550	39,500
54	9,380	43,100	60	10,030	46,000
55	10,820	47,400	61	8,960	41,000
56	10,300	47,400	62	7,950	36,800
Average		48,650	Average		40,800

Another brazing mixture of eighty-five parts copper and fifteen parts zinc, similarly remelted so that the zinc content was reduced about 2 per cent, gave a much weaker joint, as did another mixture, consisting of 305 parts copper, sixty-two parts zinc, and four parts tin The tests show that joints made with the acetylene torch were distinctly stronger than those made in the gas fire; that brazing metal containing 83 per cent copper and 17 per cent zinc gave the strongest joints, and that heat-treatment of joints brazed with acetylene gave a marked increase in strength.

Analysis of the metal in the joints shows that the acetylene torch reduces the zinc content of the metal 6 per cent, while the gas fire reduces it only 2 per cent. The difference in composition, however, does not account for the difference in strength; in fact, the reverse would be expected, since the strength of copper-zinc alloy normally decreases as the zinc content decreases through this range of proportions. Joints brazed with a metal almost identical in composition with that of the metal in the acetylene joint after brazing showed very inferior results. Whatever the cause, there seems to be no doubt that this is so.



The Evolution of the Workshop—VI

By H. H. MANCHESTER

The 17th Century marks the first break in the power of the guilds and the beginning of the factory system, due to the widening use of water power and the consequent improvement in machinery. Most of the important advances are still coming from Italy, although some of the proposed schemes are rather visionary.

(Part V appeared in Feb. 26 issue)

IT MAY have been noted in our two previous articles that the most important of the new machines of the later Middle Ages and 16th Century originated in Italy. The engineers also, of whom we have had most to say, including Marianus, Leonardo da Vinci, Biringucci and Ramelli, were Italian.

The first of the engineers of the 17th Century was likewise an Italian, Vittorio Zonca, whose machine book, "Nuova Theatro," was published at Padua in 1607. While a comparatively small work, it is important in several fields besides our own, and for us is highly interesting. It depicts the interiors of several shops for sharpening and burnishing weapons and tools. In each case this is done by means of grindstones, but in one illustration, the grindstones are run by horse power; in another, by water power, Fig. 33; and in a third, by a hand machine. Zonca also illustrates pulverizing and stamp mills driven by water power.

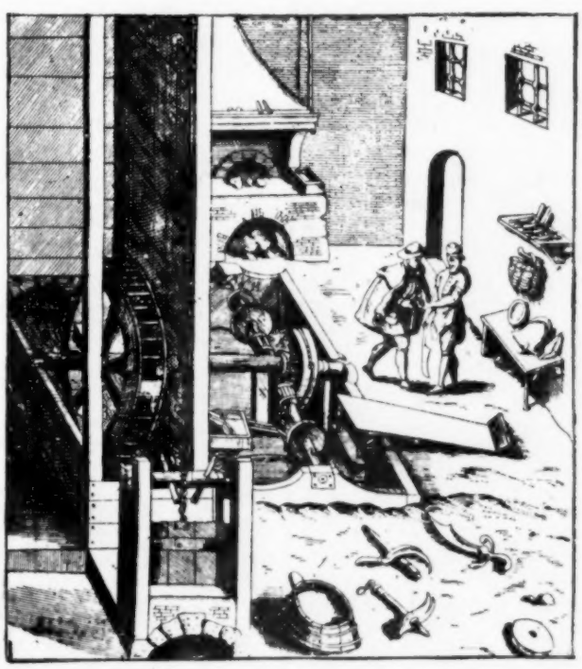


FIG. 33. A CUTLER'S SHOP OF 1607

At about the same date we read of an iron-cutting method being patented in England by Sir Bevis Bulmer. This machine was to be driven by water and used for cutting iron into small rods to serve in the making of nails. The device seems not to have been perfected, but there is a notice that a slitting mill of a cruder design had already been set up in England by Godfrey Bochs of Liege, Belgium. This and several other notices of the period in regard to iron-cutting devices leave little doubt that this method was already in successful use. In England, an improved slitting machine to be used in nail making was patented in 1612 by Clement Dawbney. A few years later, a renewal of his patent was strenuously objected to by the guilds of nail makers, but after a little delay it was again issued Dec. 11, 1618.

Possibly the first combined rolling and stamping machine for metals was a small French one that was used for the production of coin in 1615.

This brings us to an important German compilation, the "Theatri Machinarum" by Heinrich Zeising. This consisted of six parts published between 1612 and 1636. The parts all dealt with machines of one sort or another. Few of them were original with Zeising, who copied his subjects from wherever he could find them, but on this account they are none the less important as showing what devices were thought worthy of consideration at that time. The first book, published in 1612, dealt with building construction; the second, printed in 1614, with water devices; and it is not until the third book, issued in 1618, that he touches our field. Here we find water power applied

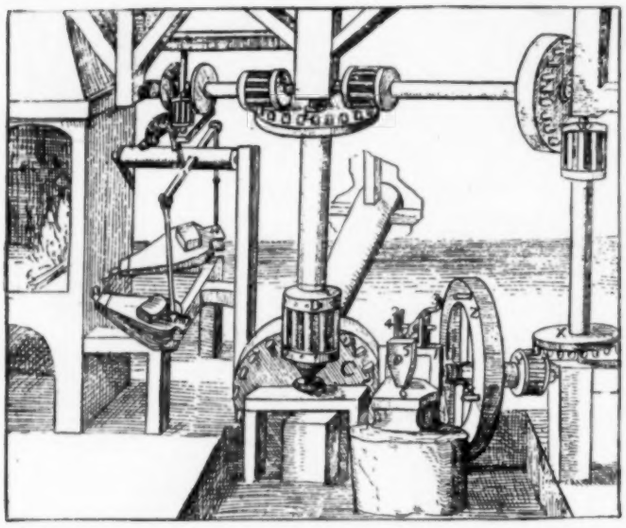


FIG. 34. MACHINE SHOP WITH POWER APPLICATIONS

to various kinds of sawing, stamping, and pulverizing. There is a good cut of the bellows and tilt hammer being worked by power, Fig. 34, and of two series of grindstones on shafts connected with belts and being driven by water power. The fourth book, published in 1629, includes several pictures of lathes, copied more or less directly from Besson.

While most of the work of Salomon de Caus in his "Les Raisons des Forces," published in 1615, had to do with other subjects, he shows a waterwheel being applied to sawing, boring, and to blowing bellows. He also includes a picture of a lathe being turned by hand power with the aid of a wheel and belt. In another section of his work he illustrates the rolling of lead by means of a simple hand machine, which in appearance reminds one of a clothes-wringer.

As if to remind us that the most novel ideas were still coming from Italy, Giovanni Branca, in 1629, published at Rome his work "Le Machine," which contains several amazing designs. One is of a small rolling machine being driven by a wheel which is turned by the hot air from a fire. One suspects that the power would have to be greater than that indicated in Fig. 35 to accomplish much practical work. Another really wonderful picture is a turbine being turned by steam, and used to drive a stamp mill, Fig. 36. Still another unexpected idea is that of a furnace being blown by air which is driven out of large jars by means of rising water. These three engravings must be considered as subjects not yet in practical use, but are of great theoretical importance.

As an antidote for the impression produced by the machine books which we have been mentioning, it is well to observe that Jan van Vliet's engravings of industry which were produced about 1630, still picture work as being done by locksmiths and other metal craftsmen entirely by hand, and there is little doubt that they portray the typical shop of the period.

A fairly good conception of the machines then considered available may be drawn from the "Theatrum Machinarum Novum" or "New Theatre of Machines," by Georgius Andreas Bocklerium and published in 1661. The first plates show the waterwheels and wind mills for grain, and it is not until plate 33 that we find grindstones driven by a belt from a shaft which is turned by an ox. There are also several pictures showing two shafts connected by a belt driven by a waterwheel. On each shaft are two or more grindstones for sharpening tools. Bocklerium, or Boeckler, gives a good illustration of the interior of a smithy or a cutler's shop, showing the furnace, various tools, and four grindstones on a shaft turned by a waterwheel. This book includes, likewise, one of the best illustrations of an early tilt hammer and bellows both run by the same waterwheel, Fig. 37. The idea was evidently to make it possible for one man to do the work in the smithy. There is also a cut of a hand machine for boring gun barrels, of another for sawing, and of water mills for sawing and log boring.

One very important general characteristic of industry in the 17th Century, one which affected the workshop as much as any other field of labor, was the gradual decay of the guild system. There is no doubt that after a greater or less control of industry throughout 500 years, the guilds in the 17th Century began to lose their grip on the various trades.

There were, however, two new sets of conditions with which the guilds had to meet. One was the enterprise born through the discovery and settlement of the New World. In many cases the craftsmen preferred the glamor of high adventure in this new field to the more prosaic tasks of the shop. The second great change, and one which affected the guilds more directly, was the introduction of water power. As machines driven by the waterwheel became larger and more complicated it required more capital before a journeyman could

FIG. 35. A REMARKABLE HOT-AIR POWER PLANT

FIG. 36. AN EARLY STEAM TURBINE

set up as a craftsman, and what is probably more important, the most profitable location for the new mills was often no longer in the cities where they would have been under the control of the guilds, but by the side of some out-of-the-way waterfalls in the country where they were outside of the jurisdiction of the city guilds.

A strong corroboration of this is the fact that during this period we find many new mill towns springing up in the neighborhood of some waterfalls or rapids.

A sign that the guilds were losing control over the organization of industry may be seen in the fact that they were no longer shooting forth branches in the form of separate trades, but were combining the smaller crafts for mutual protection into one guild. Thus, at the beginning of the century, at Kingston upon the Hull, it was agreed that the "goldsmithes, smythes, pewthers, plumbers, glasiers, painters, cutlers, musicians, stationers, bookebinders, baskitmakers shall from hence forth be but one entire company."

But it must not be overlooked that the new conditions which the guilds apparently failed to meet, were the expanding conditions of prosperity and that they failed to take advantage of opportunities. The increased production by machines and the profitable enterprises of the New World increased both wages and prices, and the guilds could not compete. These increases are illustrated by the fact that in England the wages of the artisan increased from about 50 to 112 pence between 1575 and 1700, while the workman who ran the new machines received more, and those who could build them, still more.

To take the place of the guild system in the new mills not under control of the old organizations was ushered in the beginning of the factory system. The proprietors through the use of water power and machinery so increased their production that they could pay wages high enough to draw workmen even to these more inconvenient places.

Among the comparatively new machines of the latter part of the 17th Century were Thomas Hale's rolling mill for lead plate in 1670, and Thomas Harvey's engine patented in 1678 for drawing iron into all sorts of rounds for bolts and the like. In 1683, Maundrell and Williams received a patent in England for making hollow tin balls, and the next year, in France, Castaing was given a patent for a money-rimming machine. In 1666, the Acadèmie de Royale des Sciences began to preserve the patents of the year which were later published in a series of volumes.

An Early File-Cutting Machine

It is not until 1699, however, that we find any cuts included with a direct bearing on shop work. For that year we find the illustration, Fig. 38, of a machine run by water power for cutting many files at a time. This was done both by a blow with a chisel, and by drawing a sharp cutter across the metal from which the files were cut.

In 1698 several illustrations of machine shops appear in the work of Christoff Weigel. One of these, Fig. 39, illustrates a number of tilt hammers run by water power; another depicts a hand machine for wire drawing; and a third, a hand machine for boring gun barrels.

In 1697 John Houghton described under the caption "A Note of Late Improvements" a recently developed

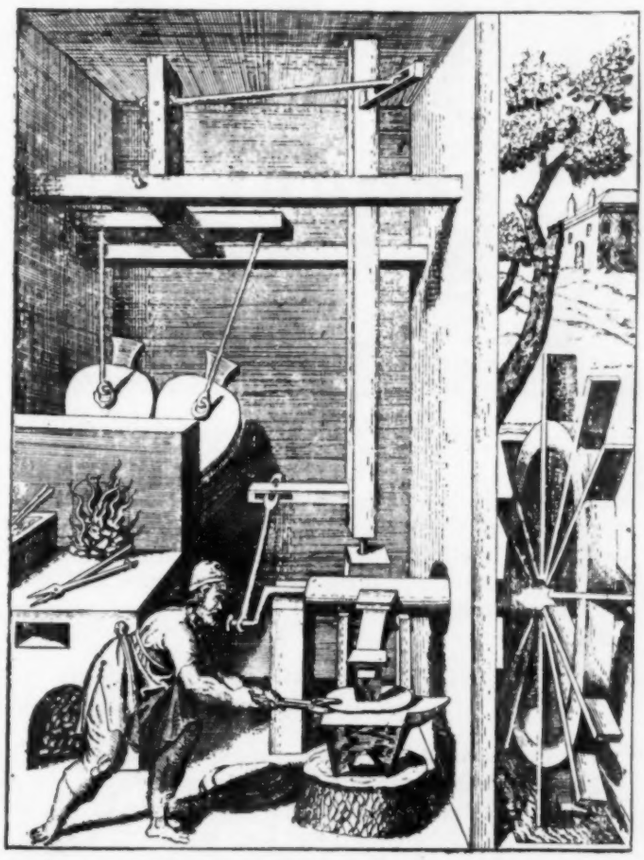


FIG. 37. A ONE-MAN SMITHY

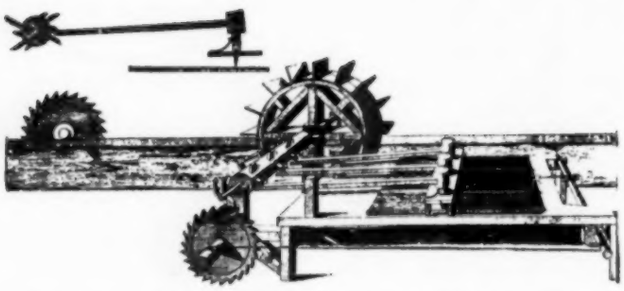


FIG. 38. WATER-POWER FILE-CUTTING MACHINE

combined rolling and slitting mill in Straffordshire. This runs as follows:

"Those they intend to be cut into rods are carried to the slitting mills, where they first break or cut them cold with the force of one of the wheels into short lengths; then they are put into a furnace to be heated red hot to a good height, and then brought singly to the rollers by which they are drawn even and to a greater length; after this another workman takes them whilst

FIG. 39. A SHOP EQUIPPED WITH WATER-POWER TILT HAMMERS

hot and puts them through the cutters which are of divers sizes and may be put on or off according to pleasure. Then another lays them straight also whilst hot, and when cold binds them also into faggots and then they are fit for sale."

Enlarging an Automobile Piston

By C. M. Starr

Wishing to make four new pistons for an automobile engine and being unable to get castings from the manufacturer, we made a corebox by cutting one of the old pistons in half lengthwise, and then turned up a wooden pattern from which we secured four castings.

In the hurry to get the pistons finished one of them was turned a trifle too small and when filed up was found to be 0.004 in. undersize. To avoid having to get a new casting and do the work all over again, I attempted, with success, the following method of enlargement:

I heated the piston slowly in a forge to a red heat but not hot enough to scale it, turning it constantly in the fire all the while to heat it evenly. I then quickly transferred it, head end down, to a heavy faceplate on the floor and laid a disk of steel on the cup end; then with a short-handled 8-lb. sledge I struck it, lightly at first, then harder, giving the disk ten or twelve firm blows. I then reheated the piston and repeated the hammer blows, after which I banked it in ashes and let it cool slowly.

When cold it measured about 0.015 in. larger than it was before, and about 0.011 in. larger than the cylinder bore; thus I was able to take a light skimming cut across it in the lathe and file it down to a perfect fit as good as other pistons. The piston was faced off at both ends, of course, before the operation of upsetting and also the disk was faced true on the underside. The piston being of cast iron it might not occur to the average mechanic that anything could be done except to make a new one, but this scheme worked out easily and without any difficulty.

Probably if it was not for the ring grooves, old pistons could be renewed in this manner by first plugging the wristpin holes with steel plugs and possibly, if the grooves were filled by squeezing split rings into them from either side, they could then be upset as above.

The operation would take far less time than making complete new pistons.

What Is a Machine Tool?

By F. J Deacon

An expert, under cross-examination, declined to specify the dividing line between high-speed and slow-speed elevators, saying by way of explanation that "it is a difficult matter to determine when a kitten becomes a cat."

For a similar reason, the dividing line that separates machine tools from other machines lies within the twilight zone.

We all cheerfully agree that certain machines, flippantly known as millers, shapers, slotters, etc., are machine tools, but we are inclined to look askance at other machines, such as presses, rolling mills, punching and shearing machines, testing machines, bending and straightening machines, spinning lathes and many others. As to woodworking machines, we would certainly be scandalized at the thought of classifying any of them as machine tools.

Webster defines a machine tool as "A machine for cutting or shaping wood, metals, etc., by means of a tool." The Standard dictionary states that it is "A machine for doing work with cutting tools, as a lathe, planing, drilling, rabbeting or tenoning machine; also a forming machine."

These definitions do not conform to common usage of the term "machine tool," and it can be safely predicted that no two prepared lists of so-called machine tools would match.

Who is willing to furnish a complete list of all machines that should be classified as machine tools?

The Labor Problem

By HARRY TIPPER
Business Manager, Class Journal Co., New York City

Here is a jolt for the one-man, one-machine, one-motion production expert. We have been so enamored with some of the results of modern production methods that most of us have not stopped to consider where all this is leading us. This word of warning from one of the clearest thinkers on industrial problems is very timely.

WE ARE almost overwhelmed in industry today by the speed with which the labor problem has come upon us. We hardly know why we should so rapidly have passed from a state of apparent unity into a state of such disorder. We cannot see what is back of these very imperative demands of the labor leader or what is back of the political strife within the labor organization itself and we are unable to visualize the difficulties that industrial owners and managers are having in retaining even a tithe of the incentive or a tithe of the interest that formerly we supposed we had from our workers.

We have to go back a little to get at the beginning of the picture. About two centuries ago the socialistic idea of political government was born in somewhat indefinite shape in France. It crossed to England early in the nineteenth century and became very strongly embedded in the political creed of a large part of the population there. It transferred itself to Germany and reached Russia, changing its conditions with the character of the country it entered. A little more than a century ago the economic idea of trade unionism was born in the north of England, on the borders of Scotland. It carried itself all through the industrial population of Great Britain, into France, into Germany, to a very small degree into Russia, and was transferred to the United States, each time changing its complexion because of the character of the population.

The socialistic idea is the only political program which has developed without any serious change and which has grown and defined itself. I want to impress this upon you because the things that we are seeing today are the results of that constant organized development which has taken place only with those two general creeds.

For seventy-five or eighty years the trade unionism idea has been very virile. It is the only economic program which has consistently developed along orderly lines from the germ to the full-fledged idea of today without any particular change. This latter idea developed coincidentally with the factory system. It is not that labor troubles began then, but the trade union idea as a collective body of labor organized for its own protection began during the early part of the nineteenth century and its development to the point of a strike practically coincided with the transfer of the mill from hand labor to the use of steam. To the workers, the trade union represented protection in the way of friendly benefit among themselves, mutual advantage, mutual insurance, mutual death benefits and protection *against* the employer. I want to emphasize the word "against," because this is warfare we are talking about and always has been.

The trade union had ample reason for its existence. The history of manufacturing in Great Britain from the beginning of the nineteenth century to 1865, and in this country from the Civil War, for twenty years, is not a history of which any present-day owner or manager of an industry could be proud. In fact, the early history of Great Britain is an appalling record of extreme exploitation economically, just as extreme in its exploitation as any despot ever was politically. This is what sowed the seeds of suspicion and consolidated the creed of action that we are finding today in our industrial life. The disease is an old one. It has been working consistently and regularly and has been developing for nearly a century. It is not possible that we can, without study, cure it or find a solution. We must charge ourselves as industrial leaders, industrial managers and professional men with a great defect. We have not studied it. In the course of a search through the bibliography of production, of scientific management, of motion study and all such books, I have failed to find any volume which discusses the human side rationally or as anything but that which is secondary to the equipment. It is true that in individual cases here and there, in England, in this country and in the other industrial countries, the practice of a single manufacturer appears to have developed an orderly human organization; from a moral obligation, as in the case of Cadbury, Ltd., in Great Britain, or perhaps from a keener and more far-sighted policy in a business sense, as in the case of Filene in the United States. We have in both countries perhaps 100 individual instances of manufacturers who have studied the human side in relation to their own factories. The present conditions are the logical outcome of the history of the case. We have not provided the worker with any other picture of industry than the one he has secured through his union organization. In fact, we have deprived him of much that he had had in his work before industry became a manufacturing system.

When I was a boy in England I had the privilege of seeing hand labor pass away in the town where I was brought up. The hand cabinet maker had a big job because he did everything from choosing the wood to the final assembly of the work. We have gradually shrunk that man's job to almost nothing in 100 years, and we have not provided him with any other important mental or intellectual stimulus of a controlled or educative character. Our educational system provides no education in industry, industrial necessities or development; our teachers are not provided with any information concerning it; our business men take no interest in it. As a rule our colleges are not practical. They are without any intimate knowledge of the history, growth, character or efficiencies of the present industrial organization. Thus, in the ranks of the workers we have had on the one side the steady, persistent promulgation and development of the trade union and socialistic theories, while on the other there has been no education as to the character and necessities of present industrial and political organization to offset this, or at least none worth mentioning.

*From a paper given before the Pennsylvania Section, Society of Automotive Engineers.

In this country the conditions are serious because our population is not homogeneous. In Great Britain they can do things that we cannot, because while they are sharply divided as to their political ideas, nevertheless they are a homogeneous people and there is a certain traditional background of political understanding and development that, for the moment, serves to erect a common basis from which the discussion can start. But we do not have this. We have millions of people whose history is one of fighting authority, who have never known authority except as an oppressive instrument and whose whole tradition for centuries has been that the only way to establish liberty is to fight for it. These people we have not educated to any other kind of authority, and yet we are amazed at what they do against authority at the present time.

I have a friend who is a Pole; he is a very great thinker. I made that remark to him the other day and he said, "You are right, Tipper. I have to remember that it is wise to compromise. My instinct is to fight because my forefathers have been fighting for generations and generations back." I know a labor leader in New York, a Russian from the borders of Poland, who told me that at six years of age he was sent out to watch so that he could notify his father and father's friends, who were in rebellion, when the authorities were coming. Such people have no idea of authority, discipline or liberty as we know it under a well-ordered government, and we are at present without any means of educating them. We have not studied, considered, or thought of the subject. We must frankly admit that while labor was reasonable in price or plentiful, we did not care much where it came from or what happened to it.

Why We Are Inefficient

This is the background against which we must consider the industrial organization of today. It must be concluded that an industrial organization is not efficient which will neglect the most important factor for production. The management must realize that orderly labor, whether brain or handwork, has the only real value, and that wealth is nothing but the surplus of past labor, at present invested in future production.

What is this change that has transpired? We know that years ago labor had an interest in its work, no matter what the work was. We know that human beings have a natural incentive for occupation. We know that it ought to be possible to co-operate decently to produce something, and that there must be fundamentals of organization which can be applied to these cases. It is apparent that the unions are not effective, nor are the manufacturers' groups any more so. Today the unions are losing their discipline because of their great size and power. So long as they were not powerful and were fighting against a larger power, they maintained discipline within their own ranks, but when they ceased to be the smaller and became the larger power the division in their own ranks appeared on the surface and their unity was shattered. This must always be true where an organization is built from a sense of demand and not from a sense of obligation, no matter whether concerning an employer group or a union.

In the course of the last five years I have checked up the action of both sides in nearly 3,000 strikes in Great Britain and this country, for I have no brief for one side or the other; they are equally unjust, in my opinion. I have seen very few instances where the union would not break its contract if the advantage was sufficient, and I have seen just as few instances where the individual manufacturer would not similarly break away from his group. In fact, the great fear of any manufacturers' group when combined is that some firm will weaken, and the great fear of the labor union is that individuals will weaken. No national or international collective body can heal the industrial unit which is split up by opposing ideas when the only possible solution comes from a co-operative effort to produce the same thing. How, then, are we going to attack the problem? There is no present solution. This is true because the disease is too old and too deep-seated, but there are present possibilities of an improvement which will afford a basis for future solution. There is no question that men once affected with an idea until it begins to operate may move to their own destruction in spite of everything. This they have done time and time again in the history of the world, and we must improve the situation if we are going to avoid disorder and destruction in the course of this movement.

The Functions of Organization

In this connection I want first to examine the industrial organization in two ways, one of which is the way mentioned in my paper; but before doing so I want to point out the functions of organization. In every human group organization there are two functions, the function of doing things and the function of agreeing upon the rules under which they shall be done. The first is the operating or executive function, and the second is the legislative and judicial function. In small organizations both of these functions can be operated by the same machinery of organization because the discussion does not need to be formal; it occurs continually in an informal way, the agreement is reached by such discussion, and the operation continues by the loyalty which is exercised through that same means. In regard to the operating or executive functions, great power lodged in an executive and prompt obedience to such power by subordinates are required. An executive must decide thoroughly and execute rapidly and continuously, which means one man power, and there must be ready obedience to such power to get the execution in force and finish the operation. Legislative work does not require immediate operation; it requires rather full, free and frank discussion and a complete agreement, for, unless the rules under which men shall work are agreed upon, the work itself will suffer by this lack of agreement, and at some point the lack of agreement will divide the organization.

Because industry is a magnificent organization, it has survived many of its failures, but the reason for the trade union—and the manufacturers' group has to oppose that trade union—is because the individual organization offers no legislative possibilities and cannot provide any agreement with its workers. It can only promulgate to them, it cannot agree with them. With an organization of 10,000 men working in the same factory and spending the major portion of their waking hours there, with their individual likes and dislikes and disagreements, a legislative requirement almost as big as that of a city is created. Immense numbers of people are employed outside to legislate for these workers during their relaxation and entertainment hours; but there is no machinery to legislate for them in the real meaning and purpose of their lives. It is because of this that the union has grown to be a very inefficient and clumsy

weapon, a substitute for a united industrial organization for fulfilling both functions in order and as they should be fulfilled.

An Incentive Necessary for Production

Secondly, every piece of work must carry its incentive within itself, and this incentive must be continually a somewhat larger mental necessity. I defy any man to stick continually to a piece of work that has no mental stretch in it, that does not offer some necessity for movement in the intellect, without either going crazy or becoming a Bolshevik. Yet we have continued for years, for a whole century, in fact, to decrease gradually the dimensions of a man's job. While we have increased his conveniences, his possibilities of ambition and his desires, we have *decreased* his job because in the old days when a man had a trade he had it and not an infinitesimal portion of it. He had to study his trade and did not become a routine machine tender with four motions to make 500 times daily.

I went into a leading electrical equipment factory a while ago. I was standing by a white-haired man. His age rather interested me. He was punching plates, just pushing them into the machine and punching them. I asked, "What is that plate?" He replied, "That is P-X-111." I said, "You do not understand me. I asked 'What is the plate'?" He said, "I have just told you." "My question was wrong, then," I continued. "What do they use it for?" He answered, "I do not know." I said, "How long have you been here?" He replied, "Twelve years."

Now, nobody can tell me that this man's incentive could possibly be in that job at the end of twelve years, nor can anybody tell me that it was other than mentally demoralizing, because it was restricting the mentality. No man ever thinks very much unless he has to in his daily occupation, because the habit of thinking is a hard one to acquire, and this man was not developing. Yet this man had the vote, the political power to overturn the government tomorrow, and we have pushed his job down to such dimensions that he has no incentive for real thought.

I do not believe it is possible to get production under such conditions. Why was it that during the war we got such wonderful changes in production? We did not change the machinery very much. I did not hear that such a very large number of inventions on machinery came out during the war, or that they so changed the operations of industry. But here is a case in England, mentioned by Lord Leverhulme, of five units making 3,000 pieces each day. They had to move the plant. They inaugurated a teamwork campaign with competition between the teams and gave such extra incentive in the way of money reward for that teamwork as it deserved. Then they added the patriotic incentive, and where a total of 15,000 pieces were made with five units, by moving over one unit the four remaining units still made that number. Next, by moving over one more unit the three units still made 15,000 pieces. Finally they were able to maintain production with only two units.

In this country, the incentive provided during the war by patriotic work and by extra monetary rewards increased production with the same organization in a number of well-authenticated cases, from 50 to 200 per cent. An incentive to work is a production question. How shall we provide it? We must do this to secure efficiency. In the printers' strike in New York City we could have afforded to pay those men all they were asking and grant them shorter hours if we could have provided that production incentive, but failing in this we could not afford it, because we could not transfer the increased cost. That incentive is the principal necessity of production. Production is not a matter of machinery. It is about time that we abandoned this idea. Throw away the old bibliography that begins and ends with machinery. Production is a matter of humanity and of human understanding, with machinery fitted to human beings and not with human beings changed into machines.

Shifting Men to Increase Production

I have an interesting case indicating that the day of courageous experimenters has not yet gone. I suggested to a friend of mine recently in connection with this one-man, one-job proposition the idea of incentive and what could be done to capture it. I said that it is partly a matter of organization, of giving the man a chance for expression, partly a matter of partnership and partly a matter of the work. I said that I did not believe that twenty-five years hence we will consider this one-man, one-job proposition a scientific proposition at all. It may take fifty years, but we are going to get at it seriously and experiment with it and demand a change.

Three or four weeks afterward he said to me, "I have been thinking about that matter and I had a very interesting illustration. We have in our mills a job of grinding chemicals on the pulverizing mill and the man has to change the pressure according to the sound of the mills. At one of our mills we had a man who was particularly sensitive to sound and who did this fairly well. We had no trouble for three years. One day I heard that the mill was out of business and that we would not get any more shipments from it for a year. I went out to see the man who was operating the mill. I had made up my mind that I could not stand that job myself, and I thought that the man was in the same box. I talked with him when I arrived and when at the point where I thought we understood each other I said, 'Tom, why did you smash that mill?' He looked at me and seemed to wonder whether he ought to say anything or not, and then said, 'I was not feeling good that morning, and I wanted the noise to stop.' 'Well,' I said, 'that's all right, Tom; I guess I agree with you; I would grow tired of it, too, once in a while, but I have arranged that you will take Bill over here from the packing room and train him to do your work just as well as you can, and you are going to take half time here and half in the packing room. The packing room is nice and clean, there is no noise in there, and any time in the morning that you do not feel like staying at the mill because you do not like the noise you go out into the packing room and let Bill come in here."

The final result was that my friend said to me subsequently, "I have taken on about five other departments and switched them around. I have the men in the packing room doing all of the six different jobs there. I rotate them around the whole six, and we are getting twenty-five per cent more work. I suppose that I will not notice the real effect for a year or two yet."

Such may not be the solution, but it suggests something. Mr. Beecroft told me that one man who began that method in one or two departments of an engine factory in Great Britain started a man to grinding crankshafts and fitting them to bearings. Next he had the same man make the bearings. He said their accuracy and speed were better, and the men were more con-

tented. I do not know, but it seems to me very human that they should be.

Everything that the psychologists and the medical men say to us is absolutely against the extreme concentration of mental and physical activity upon a few motions. When training workers in the textile factories where women were working under the most cruel operating conditions, I have seen girls become hysterical and have to be taken out within the first six days of their training, who absolutely became sick on account of the very high tension caused by that constant necessity for repetition at a single given second. You know how they must relax to escape from it when they get out, and the intensity of their emotional relaxation outside is the necessary protection provided by nature to get them away from that intensity of concentration in their work. I believe this is not good production. I am sure it is not good human production, and I believe it is making a race of men who are not capable politically of self-discipline, self-government and real sound judgment.

Need for Publicity and Education

Education is another point, publicity education. Business has been too secret. It was nobody's business what a manufacturer did or what he made or how he made it. Least of all was it the employee's business to know this, and yet the manufacturer now complains that the employee does not understand. Well, how in the world could he? Where can he get understanding? There is in the United States no school, no public school, where he can get it, because nobody in industry has supported the schools. They do not know anything about it.

A manufacturer in a small town where he has been a power for thirty years was giving me his opinion of the character of the workmen he is now getting. I asked, "What is the public school system in your town?" He said, "I do not know." "Well," I continued, "What is the curriculum?" He answered, "I have never thought about it." "Do you know any one on the school board?" "No; I did know one of the police, a friend of mine, but most of them are politicians and I do not know anything about them." I said, "Did you ever run a night school in your place?" "No," he replied, "I thought about that this last year or two but I did not do it." I said, "Where can your fellows get the information? You never publish any statements about it. You never take the time to tell them about it, and they do not know whether your overhead is camouflaged or whether it means expense. They do not know what your stock is. They do not know whether you have printed pieces of paper and sell them for money or have an obligation on it. They do not know, and they have been born and brought up, from the time that they have been youngsters, with the tradition of the trade union idea which tells them that the manufacturer is logically and seriously unjust, and that they cannot trust him. There is just enough of record in the history of the thing so that they have the chapter and verse to remind them continually about it, and you have never done anything serious to combat this. It is true that you have established a few hospitals which the labor leader said came out of what ought to be wages. It is true that you have established a few playgrounds and activities of that kind, with the same comment from the labor union, and it is true that there have been established occasional night schools to train employees better for their work, but it is not true that attention has been paid to the manufacturers' necessity that the workers should know. They should know because they are in the majority and have the majority vote. Unless we are to have a government by the unintelligent and ignorant, which is the worst and most unjust government that could possibly threaten anybody, we must increase the intelligence, judgment and capacity of the skilled men who are working with their hands and the brain-workers, so that we can get a more co-ordinate understanding of the industrial problem."

There is not any question in my mind that production as a science is just beginning. We must gather together in industry; we must listen to what the medical men have said, and they have said some very pertinent things on the character of fatigue, on muscular movement, on the fatigue effect of continued rapid muscular movement, and on the mental system and its necessities. And we must think about the psychology of the problems because our production depends not upon the amount of brawn a man has or the capacity of a machine, but on the thinking that the man does in connection with his machine and his work. Our present and future problem is a human problem, the governing factor of production. You know enough about equations to realize that when the governing factor is left out the remainder of an equation might just as well be thrown away.

The Discussion

W. M. Newkirk: I have attempted at times to get our superintendent to try shifting the men around, and I always met with the objection that they cannot get started at it, that they lose a part of their pay for two or three days or even for a few weeks before they get used to it, and they always fight the initial move. I know it to be a good thing if you can once get it started. I wonder if you can give us any pointers as to how to lubricate the start.

Mr. Tipper: That is always the difficulty with new things. The inertia which has to be overcome is the hardest thing. The average man will not accept responsibility and we have to start it. Only a few experiments have been made in this direction; the lack of experiments in this direction is almost amazing, but in one or two cases it has been started by taking a particular problem that developed itself and operating on that problem. It obviously takes about fifty times the analysis to route men properly that it does to keep them still. It is comparatively a very easy thing to put a gang of machines together and then fit a gang of men to those machines, but to take a number of men and fit the machinery operation to them is an entirely different story, and I do not wonder that the men balk at it. If we have not studied human nature very particularly, except as every man knows it, of course, this is a hard job. It takes far more analysis and keener judgment. To avoid confusion and get the results of related work is a very difficult job. I do not think as much rotation is needed as would seem to be necessary to the man who has not studied it. Just take two or three matters which are closely related, that will provide variety of muscular and mental activity and utilize the results of previous work in its relation to the other work that a man gets. If a man can just see the results of his work he has gone quite a distance. The reason it was wise to put the man who had been grinding crankshafts at work on the bearings of the engine is because the results of his grinding came right out when he fitted them up. These results also fitted right back into his previous work, and with the three jobs it gave him more than nine times his former horizon and three times the

change in his position, his mentality and his physical concentration.

But you will have a hard time in trying to put this over with anybody. A man will transfer his responsibility of thinking if he gets a chance.

Small Beginnings Essential

It is the inertia against experimenting that is the hard job. None of these things is half as hard when you get down to it as appears on the surface. You look at the whole shop and say, "I cannot do that!" when if you would take two or three men that are a problem, work it out with them and get their help you would probably hit upon the practical scheme. I have no faith in this large national conclusion. It never got anywhere or never did anything in human affairs, and that is the reason why I have no faith in the industrial conference at Washington or the international labor conference. You cannot settle things for 1,000,000 people by one conference. You have to settle it with a few people here and there, and when you have a fair proportion of those problems solved your big questions are automatically settled. If you start with one thing in a particular corner of the shop and settle it, by continuing this you have the shop running smoothly on a diff rent plan before you know it. That is the only way that I can see to get it done.

C. A. Musselman: Have you been up against this problem? You know that in the printing business there are a number of unions, including those in the composing room, bindery and press room. We have attempted some shifts but the unions object.

Mr. Tipper: That is to be expected. The only point there is this, how well off are we at present? We are trying to evade an issue, because we do not know whether the frying pan is a little cooler than the fire. We are in the frying pan and have been in it for a number of years and the fire gets a little hotter right along. The question is, are we going to jump out into the fire or on the grate. We are afraid to try, we have temporized and temporized with this question and we have waited right along and never done anything about it.

The unions do not want a solution because they are not nearly so much interested in solving the problem as in maintaining the strength of their rights; neither is the manufacturers' group. I will guarantee that any salaried official would hate to see a solution of the labor union that did not come through his association. He is behind it in the virility and capacity of that group and cannot think of any solution outside of that and he is against anything that tends or appears to break up that organization. But how are we off today? The leader says, "Don't do it," and the men do it, at least a sufficient number to embarrass us. In the printers' strike in New York City we are in the position of the innocent bystander who got into the trouble. We have nothing to do with the case. Certain unions have refused to do what the central union has requested them to do. The same thing is true in Great Britain. I am watching these cases by reading the London papers every week. There is a standing agreement which the iron founders' unions and the manufacturers have had for a board of arbitration for twenty years, but three units decided to strike in the face of it. The longshoremen struck without their leaders. Fully fifty-nine out of sixty strikes that occur at present are unauthorized and mostly unapproved. What is the use of considering the opinion of a union that cannot discipline itself? The only unit is the factory that the men are working in. You cannot split it and heal it by a national or international agreement. It cannot be done. You have to start the experiment in your own shop and take the troubles as they come, just as you have taken the present troubles as they came.

It is over two years since the I. W. W. started work at Toledo very strongly. Their organization there is almost as large as at Detroit. The strike at the Overland plant at Toledo had been due for six months. It was authorized six months before it touched Toledo. There was nothing which the Overland people could do to prevent that strike. The organization of that strike antedated the company profit-sharing by a great many months. That strike, like the organization of the steel strike, was going on for six or eight months and some of it was fifteen months in organizing.

It may be interesting for you to know that the radicals of all the Russian and Soviet societies in New York and the I. W. W. have 2,500 paid lecturers today in the United States of every race that is important industrially as workers, and that they have 40,000 active workers in the city of New York, and they have closely organized and intertwined headquarters in every industrial city. If you are known at Fifteenth St. in New York City, you can get all the material to strike in any industrial city in the United States within a week after they have passed upon all the credentials.

The Importance of Traditions

I should like to add just one point to that while I think about it. I made the point in my speech, and I am afraid it has been overlooked, that you did not get the significance of it, the traditions of these people. You know yourself how strong your traditions are, how much stronger they are than your recent reasoning, that on the very slightest occasion your tradition governs your sentiments, your reasoning goes by the board. There are millions of people in the United States who have no traditions except that authority is something to be fought, and they are fighting that authority here just as they fought it at home, where they had good reason for that fighting. They have been fighting for centuries in one way or another the authorities who have been forced upon them. You cannot destroy that condition; you must expect it to operate in all the councils of labor in this country, with little attempt at Americanization and with a background which is so strong. I have just told you that in every race there are lecturers constantly inflaming that sentiment as a part of their present program. I have seen them inflame the racial sentiment with things that happened a long time ago.

Russell Hoopes: The subject has been very interesting. We are a small organization and keep very closely in touch with our men. Whenever troubles come up we try to solve them then and there. We try to do just as Mr. Tipper had said, get into human touch with them, but believe we have failed to a very large extent. I have recently read a book with which probably most of you are more familiar than I, "Man to Man," by John Leitch. It probably throws more light on what Mr. Tipper has been telling us than anything which I have picked up lately. Does it not shed considerable light on these problems?

Mr. Tipper: Yes, John Leitch has done much valuable work. He has operated what perhaps is, up to the present, the most successful of the four different systems of providing legislative machinery in your own

organization. There are four systems, the House and Senate plan that is John Leitch's, operated after the political plan of the United States, which makes it simple and easily understood; the joint council plan which was promulgated by John D. Rockefeller but which was in use in an indefinite way previous to that time; the joint committee plan which is a rather different plan from the joint council, and then the union plan which is the importation of the Whitley idea from Great Britain.

Mr. Leitch's plan is very successful. He is very sincere and thorough, wise enough not to take on more than he can do, and wise enough to see, and to oblige the manufacturer and the workers to see, that this can only be done because of an element of confidence and trust and that it will take some years to work it out. It is worth looking into. His book is good. It is one of the things which offers a possible and a probable basis for a solution of our troubles, at least a marked improvement in the labor situation, if we can take hold of it wisely, patiently and with a full understanding that we are not giving the benefactions but are actually trustees in the case; and provided—and I want to make this proviso because I have run up against it so much—provided it is properly promoted and understood when put into operation.

How Not to Introduce a Plan

One of the largest companies in this country put in such a plan. It spent nine months looking over these plans and decided which it wanted before putting it into the shop, and then it put in the plan. It promoted the plan in an organization of over 20,000 employees, including about fifteen races, with one notice in the different languages that looked as much like a summons to a police court as anything I have ever seen, and one booklet which began, "Nothing hereinafter provided abrogates the right of the company to discharge a man," and so on. The benefits were in the back of the book. It put the whole plan over in that promotion and it has, of course, had trouble as a result. There was no common basis of understanding, and if you pitch a lot of men into an organization for which they have not been prepared you are going to have extreme demands, confusion and discussion and get nowhere and do nothing for a long time. You can avoid that if the thing is properly prepared and understood. On the other hand a company that I know spent two years with a plan somewhat similar to this of John Leitch. Its promotion was very effective because time and energy and brains were spent in preparing the plan.

Mr. Musselman: I should like to know if Mr. Tipper's investigation and experience have taught him that when the factories attempt to better the conditions of the men it results in the focussing of the unions upon their efforts, bringing disaster rather than benefit.

Mr. Tipper: There is no question that from time to time a change in the organization of a manufacturer's plant to furnish a better means of providing an organization has brought the unions down on it, but I want to point out the fact which still remains that there are plants in this country that have not had a strike in ten or twenty years, not because of special machinery, but because of the character of the human contact within the plant. Plants which have been using some special organization for eight years have never had a strike, and others which started the organization not long before the war did not have a single strike in the whole war. The allegiance which you can create in a plant for the employer is stronger than any other allegiance, if you can get it, and you can stand any other disaster if you can get that. If you cannot get that, all other disasters are going to overtake you anyway, because after all what the workman wants is not the affair of his class in Chicago when he is a New York man. It is the settlement of his own individual and collective problems in his own establishment, his own kind of work, that he desires. It is true that there are a certain number of floaters, but in most establishments these become settled or solidified.

The Experience of the Needle Trade

There is no more radical bunch than the members of the needle trade in the United States. They are very largely Eastern Europeans, but include a large number of Russians. In New York City they are the center of the radical societies. There is a large company in Cleveland that had the John Leitch plan in operation four years ago. It has this same class of labor very largely, which is the poorest one to do anything with, since it has a naturally rebellious background of fighting authority. During the war there was a strike in the needle trade at Cleveland. The committee of workers in the plant to which I refer wired Washington to leave them out of consideration altogether; they were not on strike, were quite satisfied and did not want to be included in any way. They wired twice, and then some of them were called in as witnesses before the War Labor Board. Then they sent a committee down to Washington to see the Secretary of Labor, to make sure that they would not be included in the decision which meant an increase of wages in the general trade.

Mr. Hoopes: This is a very interesting question, and in my own experience I have perhaps come as closely in contact with employees as anyone here. Hoopes Bros. & Darlington has been in business for over fifty years. We have one of the older generation still living who is active at eighty-five years of age. There has been a close contact all the time with the employees, and I can truthfully say that we have never had a general strike in the whole organization. We have had a strike in one or two departments that lasted probably a few hours, but as for a genral strike or being out even half a day we have never known what it is. I attribute this largely to the personal touch we have had with our employees. I ought to qualify that by saying that the plant is located in a rural community of good old stock. We do not have to bother about foreign workers and we get a good class of labor. Both those things have produced good results.

G. Walker Gilmer, Jr.: What Mr. Tipper has said is bound to be of interest to everyone employing labor. I am a laborer myself because my firm employs me to labor. We have troubles which have never gone far enough to get into the strike stage, but we realize that we have not the efficiency which we had several years ago and should have today. Just how we can get that interest of the employee is a question that is naturally concerning us, and we have from time to time discussed it. We have our foremen's meetings regularly to discuss just such questions and how they are going to be solved. Mr. Tipper says it is now a question of warfare. I do not believe that is right, and it is not exactly a period of unrest. It is rather one of misunderstanding. A few years ago the manufacturers did not understand each other; consequently, each thought when the other fellow was going after his business pretty hard he was going

to cut his throat. They got together and began to believe that each man is honest, and we are, and so is the laborer, I believe. Generally speaking, I believe that the laborer is opposed to striking. The difficulty is that he has been listening to propaganda carrying out the old belief with which a great many of them came to this country feeling that it was up to them to fight somebody and they did not have anybody to fight but the employer, and they are doing that. They are not fighting altogether in an organized manner at the present time, which shows that there is a lack of understanding even in unions. There is really only one remedy that I know of and that is the counter propaganda of education. A great many firms are working on it at the present time. It is not new. It will take years for it to amount to anything, but I believe that we will get results. There is no disease that is widespread which has ever been cured in a short time. We have just learned that the Surgeon General of the Army has cured yellow fever. He has been working on it since 1897 or 1898. He started in Cuba, I think. Possibly he has cured it. We can cure the misunderstanding which exists in labor today if we can understand labor and make labor understand us.

I believe that it is possible by changing the men around from one position to another to educate them and interest them by the use of publicity or rather pamphlets and possibly pictures, showing the connection of their work with the work of the various departments and also with industry in general, showing the connection between my plant and some other man's plant. There is much that can be done, but it has to be worked out slowly.

Why Conciliation Fails

MR. TIPPER: I just want to add one more point in conclusion, a thing brought up a little inferentially. Of course it is a misunderstanding, but that misunderstanding is war. Manufacturers said competition was cutthroat when it was not organized by friendliness, and there is no organization by friendliness between labor and capital today. Both sides are more concerned with strengthening their outposts than finding a solution, and that is the reason why, when they went down to Washington, they adopted the group vote in conference. They could not conciliate. Gompers could not conciliate because he had to strengthen his organization. That is a type of war; it may be the forerunner of a more serious type of war if it is not understood and measures taken to spread the understanding. That is what we have to do, and everything that I have said tonight has really been in a measure the spreading of understanding. We cannot do much spreading unless we understand something ourselves, and I want to recommend as my last thought that you take notice of the statement of a friend of mine who said, "There are a number of people who study but who do not think." That is the reason we accept the traditions of the past and study without questioning, because we take the textbook "as is" without thinking whether we agree with it or not. We want study on this, yes, but we want understanding which is the motive of study. If we get understanding we will move, but if we merely study and do not get understanding we will not move.

M. C. DITTMANN: How can we expect the operator of a machine to see the possibility of his becoming readily proficient in handling a different type machine from the one he has been accustomed to handle for a long time, when we employers, who are supposed to have a much broader vision than the operator, have difficulty in reconciling the possibility of a man who has become trained in the operation of a certain type of machine being able to switch over to a somewhat different type of machine? I should think this would be particularly difficult if the operator was working on a bonus system of reward, whereby he was paid so much for each piece and on his regular machine was making a certain amount above his minimum wage. Would he not consider that if he was shifted over to another type of machine his wages would fall off, due to his inability to produce, for the time being, at the same rate as was possible on his regular machine? On the other hand, if in offering an incentive to him to change over to the other type of machine, we gave him the same average wage that he had been earning on his regular machine, how are we going to offer him the incentive to reach the point of efficiency, or better, on the new type that he had reached on his regular machine? When we carry him along at his average previous earnings he merely has to run along without exerting any particular effort, for he is guaranteed his previous average wage and why should be exert himself to produce more work when he is getting paid what he previously earned?

The Need for Diplomacy

MR. TIPPER: That is a very acute and practical question, and it can be answered in two ways: First, it is not likely that in 100 per cent of the cases, it will be necessary to change a man's job immediately. Nevertheless that is not the answer to the question. The formal method of doing a thing, the decision of a plan, is usually the poorest method of starting it with human beings. It is like saying to a man, "I am going to shift your job today and next week I am going to talk it over with you." I have got to sell him that shift. If I say to him, "Bill, you are a good man. I think you have a little more capacity than just this job, and I have a little problem here. I wish you would shift yourself over to this particular proposition and see if you cannot straighten it out for me," I can capture his interest and get him working on the job. He does not know that there is any shift. He is merely helping me out. If it is valuable for him to change his job, it demonstrates itself to him and to me without any formal demand that he remove himself from this plant and go over there. There is a tremendous amount of inertia to overcome. We do not like to move until we reach a certain stage of responsibility. After that we move automatically, because that responsibility has bred the habit of movement in us, but before that we have great inertia; and, as your intellectual capacity decreases or the necessity for it decreases, your desire for movement decreases. When you do not use the muscles they become so weak that you cannot use them after a while. The same is true of your mentality. It is painful to bring it back into actual existence and usefulness, just as in the case of a sleeping limb it is painful to bring it back to usefulness. Some of the pain is going to occur, and I do not believe that in every case it will be possible to change the whole proposition, or any single job, as a formality; but I believe that you can find out much and discover the changes that are valuable if you will approach it not as a formal but rather as an informal proposition. I believe in never revolutionizing any organization. It is a painful process and it takes so much longer to get the balance; the pendulum is always swinging too far

You can only do it by evolutionary methods. To find out, you have to begin, and the best way is to begin informally with a problem as it comes up. If you do it that way, I think that you can get over much of the difficulty, although you are bound to have some.

MR. DITTMANN: Assuming that you have 100 men operating a particular type of machine, had you considered taking each of these men as an individual case or do you believe that the record the first half dozen or so of these men make in this change of operation will be sufficiently convincing and enough of an incentive for the others to agree to change over to a different type of machine?

MR. TIPPER: I think it is better not to start with too many men at first.

MR. DITTMANN: I am assuming taking one at a time.

MR. TIPPER: If you take one, two or three men and give them sufficient time so that they are finally efficient in two or three men's jobs, as a problem they will sell it much better than you, if it really answers the purpose and gives an added interest to the men, an incentive. By taking the problem of one or two this itself will bring you finally a demand on the part of others, and the more intelligent man will demand it first because he will see the value of it. I think that there is no other way to do it. I would not counsel anybody in any of these changes to proceed as though this thing was a formal plan. I do not know how it will work out in the next generation or two. I simply point out that we have stultified a man over what he was 100 years ago, and we cannot continue to do that without producing a nation of brutes before we get through. We must turn around and I do not think that it is wise to go too fast the other way. Otherwise, we will get utter confusion and disorganization instead of an orderly progress of organization.

Extending the Use of Precision Gage Blocks

BY ROBERT COATES

It seems to me that the increasing use of precision gage blocks for checking up work opens a fruitful field for discussion on methods for extending their range of use without destroying their value as precision measuring tools by subjecting them to excessive use or abuse.

With some firms precision blocks are as yet in the luxury class and in no immediate danger from use. Others treat them with the same awe and reverence that was accorded the micrometer about thirty-five years ago.

Some firms may have surplus sets (I'm not checking up malefactors of great wealth) but most of us figure we are lucky if we can get the use of one set occasionally; therefore, the problem is: How can we extend the use of a set without destroying its value as a standard, or temporarily reduce the range of combinations by having some blocks tied up on work in the process of construction?

One of the most convenient aids I have found to use in conjunction with the precision blocks is the adjustable parallel. This is a standard tool made in a variety of sizes, the range of which can be increased by the addition of extension pins screwed in on one edge and the ends of the pins ground parellel with the adjustable base.

This method gives very good results in locating the position of holes in dies, jigs, etc., on the lathe faceplate when used in combination with the conventional 90-deg. angle piece, the internal faces of which are located at predetermined distances from the axis of the spindle.

In using precision blocks for locating the position of work on the faceplate or some substitute that has been set by comparison with these tools it is always well to remember that it does not follow as a natural sequence that the hole made will be in the exact location. This is due to the fact that the location was determined when the spindle was at rest and that the hole was made when the spindle was running and probably out of dynamic balance; therefore, if you use blocks or a substitute set, counterchecking, prior to finishing, the hole to exact size, is always desirable.

I would further add that the adjustable parallel is very convenient for measuring snap gages during process of grinding and its near relative, known as the adjustable planer and shaper gage, possesses the same latent possibilities for larger work. This may serve as a suggestion for some of the budding Johannsons to get out precision adjustable parellels provided with means to receive extension rods of various lengths.

Setting the Milling-Machine Vise in Alignment

BY J. A. RAUGHT

On page 356 of the *American Machinist*, under the above title, John A. Grill gives out a bit of information that is to some extent misleading because of the fact that in setting a milling-machine vise, the in and out feed should not be depended upon if one expects the work to come square. The in and out feed is seldom, if ever, perfectly square with the ways of the table, especially after wear has been taken up by tightening the gib.

If Mr. Grill wants to set the vise at a right angle to the table ways let him get a square that he knows to be perfect, place the beam against the solid jaw of the vise and hold it there with a block of wood between it and the movable jaw, with the blade lying parallel (or nearly so) with the table ways; then he may proceed to line up the blade by means of a reliable dial indicator.

If an indicator is not available, inside micrometers are next to be desired, and as a substitute for them use a pair of outside micrometers just as you would the inside tool. If none of the three articles are available, use a piece of quarter-inch drill rod rounded at the ends as a length gage.

Run the table back and forth nearly the full length of the blade of the square, taking all measurements from a single point at each end.

If the work is of such a nature that it requires the in and out feed only, the solid jaw of the vise should be set parallel or at right angles to the in and out ways, as the case may require, by cranking the table in and out and using the square in the vise as before; or a parallel as he shows in his cut, depending of course on which way he wants to stand the vise.

I also beg to disagree with Mr. Grill when he says that the micrometer can be held firmly in the way shown without injuring it if good judgment is used. A micrometer should never be pinched between two pieces of metal unless the pieces are well padded with felt.

Forging Mechanic's Hand Tools

By J. V. HUNTER

There are many mechanic's hand tools, used extensively in connection with general steel and machine assembly, that are made by forging. The simple and accurate forging methods used by one shop in the production of such tools are described and illustrated in this article.

MANY manufacturing and erecting plants maintain more or less of a force in their blacksmith shops to produce small lots of hand tools to meet their current daily needs, though usually such tools could be purchased at less cost from a tool manufacturer who has specialized in this work.

In the forging shop of the Ketler-Elliott Erection Co., Chicago, Ill., power hammers are exclusively used

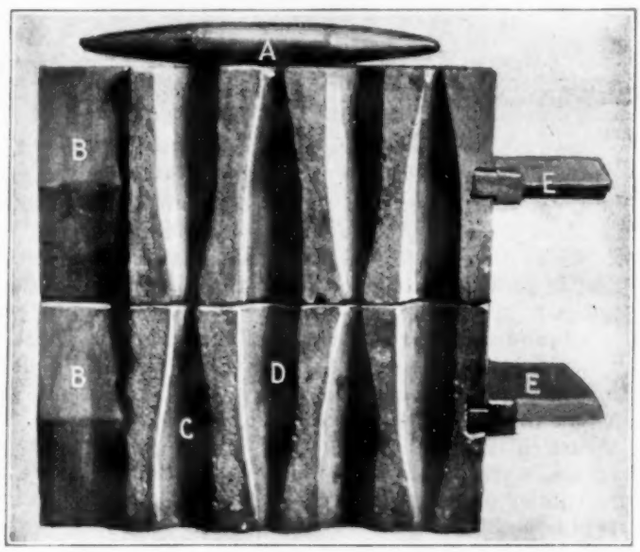


FIG. 1. DIES FOR FORGING DRIFT PINS

for tool forging, each hammer being well equipped with suitable dies for the work upon which it is engaged.

Among the simplest tools forged are the drift pins that are used in connection with the erection of structural steel work. A sample of the common form of drift pin, *A*, Fig. 1, is seen lying on the pair of hammer dies which were used for its production. These pins are worked from the end of a bar which is heated in an oil furnace.

The smith for his first operation draws down the forward end of the bar between the tapered flats *B*, and then rounds it up to a conical form in the pass *C*. Gaging the length from a fixed stop on the far side of the hammer he starts to draw the inner end of the drift pin as shown in Fig. 2. A few blows of the hammer with a quarter turn between each blow partly draws the taper on the inner end, and this is then finished in pass *D*, Fig. 1. The nearly completed pin is cut from the bar by the hot chisels *E* dovetailed into the ends of the dies, after which it receives a few finishing blows on each end to straighten and finish it. The other two passes in this pair of dies are for forging a smaller pin.

Two classes of pneumatic-hammer chipping-chisels with either forged or machined shanks are furnished by these shops. The former type is of the greater interest because one rarely thinks of forging work being done to close enough limits for this purpose.

One of the forged chisel shanks is shown in Fig. 3 at *A*, together with the dies in which it was produced. The operator handling this work under a Mayer trip hammer is shown in Fig. 4, and it is possible to gain an idea from this of the method of feeding the chisel blank through the guide plate *B*, Fig. 3, attached

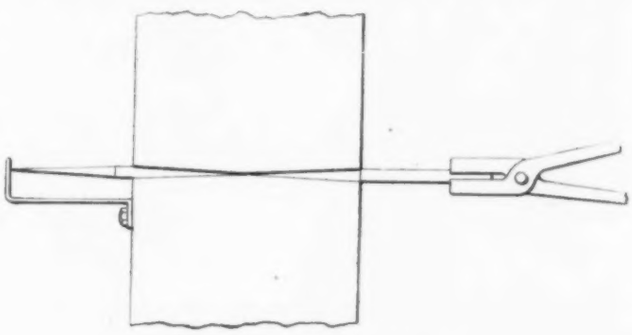


FIG. 2. GAGING STOCK FOR PINS

to the front of the lower die. For the first operation the smith breaks down the shoulder *C* in the left pass *D* of the die. In doing this the piece is inserted clear to the back of the tong's jaw, and the nose of the latter is then held flush against the face of the

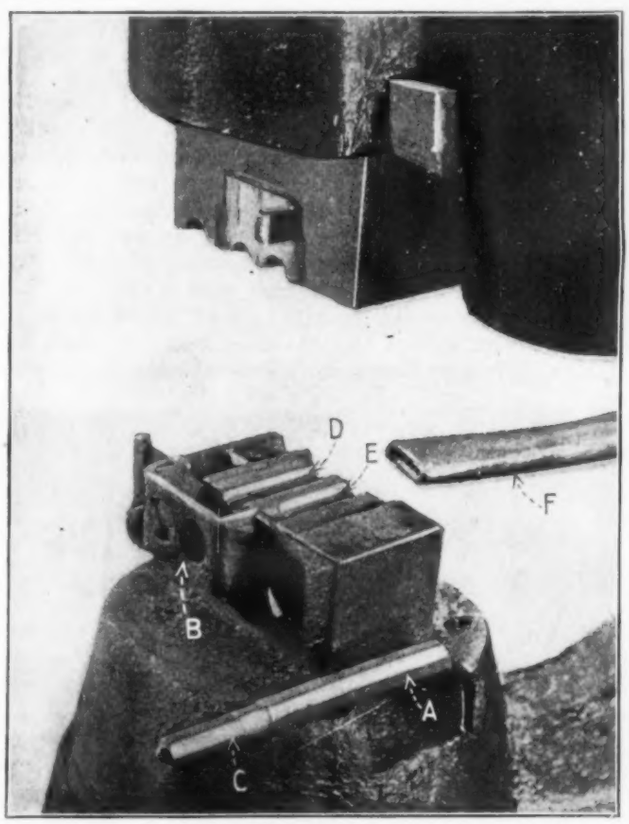


FIG. 3. HAMMER DIES FOR SHANKS OF CHISELS

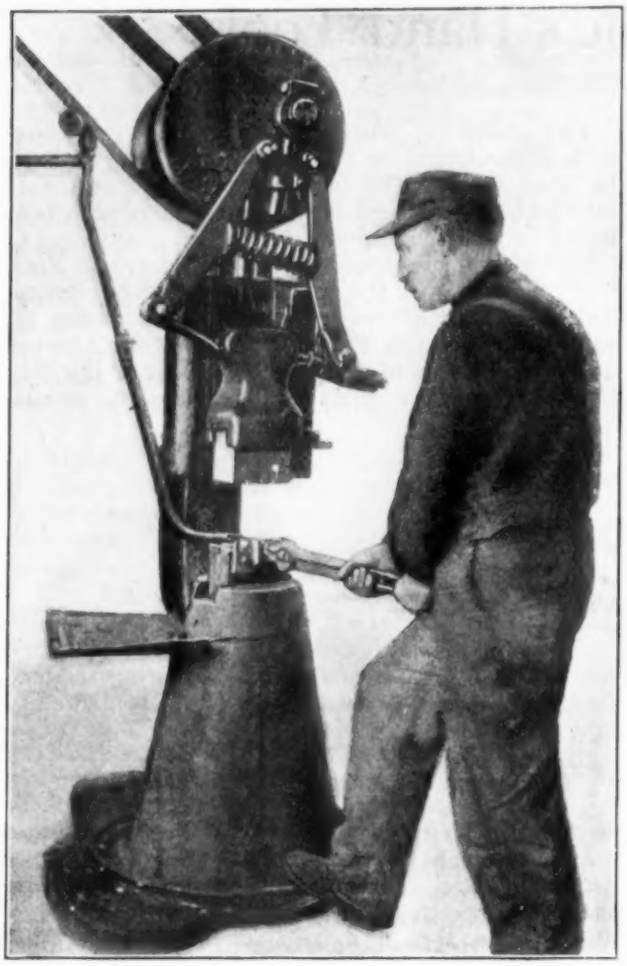


FIG. 4. OPERATOR FORGING CHISEL SHANKS

guide plate which thus acts as a gage during the breaking-down operation so that the correct amount of material will be used to form the shank. The shank is then inserted in the pass *E* where a number of blows are used to work the hexagonal section into form, and the round shoulder on the rear end of the pass draws that portion of the shank more closely to size. A strong blast of air from the pipe *F* is constantly used on the dies to keep their surfaces free from scale.

At a nearby anvil the smith cuts off the excess length of the shank with a hand hammer and hot chisel, and the a few more blows are given between the hammer

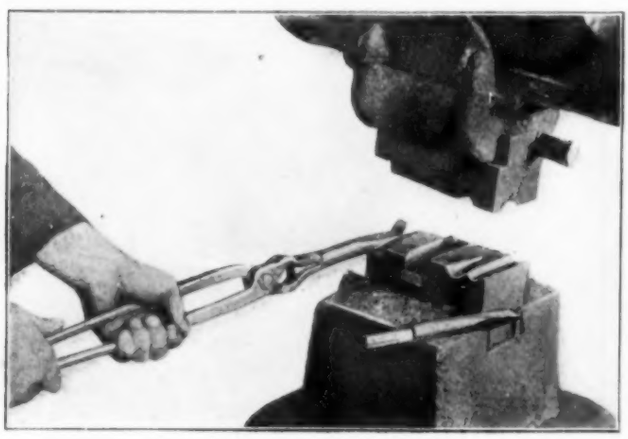


FIG. 5. SHEARING ENDS OF FORGED CHISELS

dies, turning a different side up for each, to insure that it will be close to the required size. The smith tests the forgings with a "pass and not-pass" ring gage in which the necessary allowance has been made to provide for the shrinkage of the steel on cooling.

The cutting end of the chisel is forged under a Bradley hammer, the dies being illustrated in Fig. 5. These have several passes with different degrees of

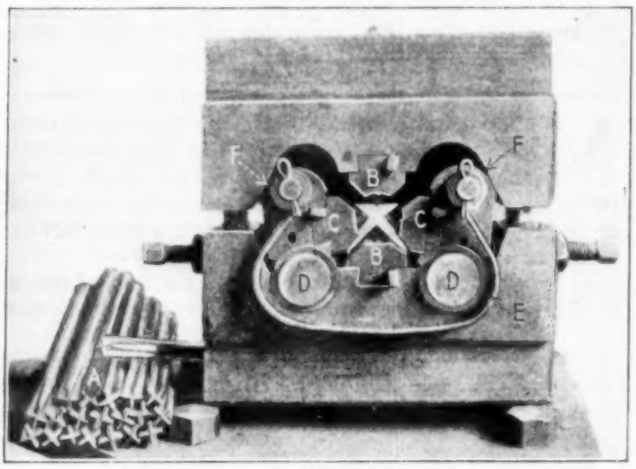


FIG. 6. FRONT VIEW OF DIES FOR STAR CHISELS

taper so that they are suitable for making several types of chisels. At the left of the dies, the smith is shown holding the forged blank on a small nicking chisel that is provided to cut off any excess protruding from the end.

An unusual pair of dies for forming star chisels under a Nazel hammer is illustrated in Figs. 6 and 7 together with some of the chisels produced at *A*. In action the dies depend upon both direct stroke and side thrust, utilizing the former to do the greater portion of the work, while the side thrust, which is more a matter of providing support for the sides of the star, is obtained by means of swinging arms actuated by the down stroke of the upper die.

The forging work is done by the inserted dies *B*, Fig. 6, carried on the main bodies of the upper and

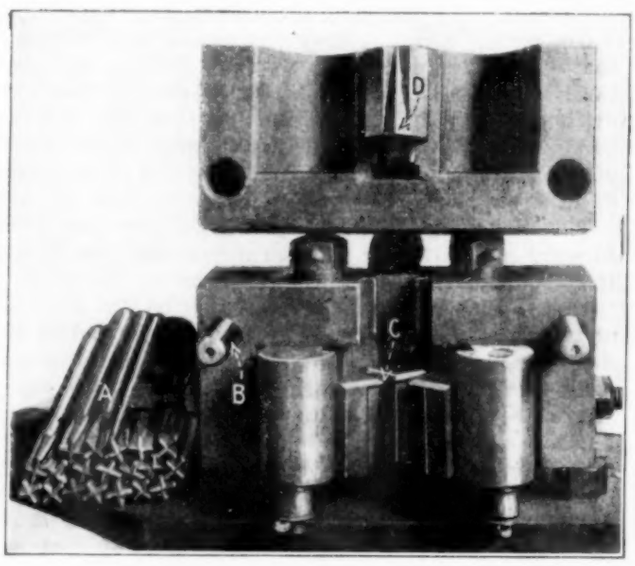


FIG. 7. INSIDE FACES OF STAR-CHISEL DIES

lower die blocks, which actually form the imprint, and thrust out the sides of the star. Then the chisel is given a quarter turn and worked further forward into the dies, and as this is done the side-thrust dies *C*,

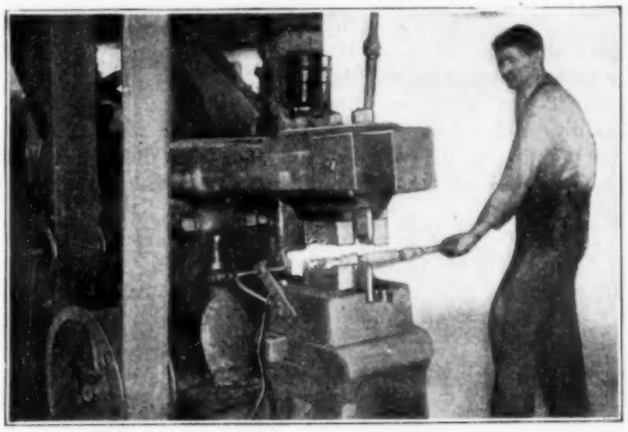


FIG. 8. FORGING BLANK FOR RIVET SETS

carried on the swinging arms, maintain and further shape up the imprints previously formed.

The swinging arms are fastened to the lower die block by means of the heavy pin *D*, and in addition have a half-round bearing directly upon the lower die block to prevent the hammer blows from shearing off the pins. When opened, the arms stand in such a position that the inclines *F* in the top die can catch them on the down stroke and draw them with a smart blow in upon the work. When the upper die rises, the loop spring *E* throws the arms into the open position.

In the view of the working faces of the dies, Fig. 7, it will be seen how relatively heavy the arms have

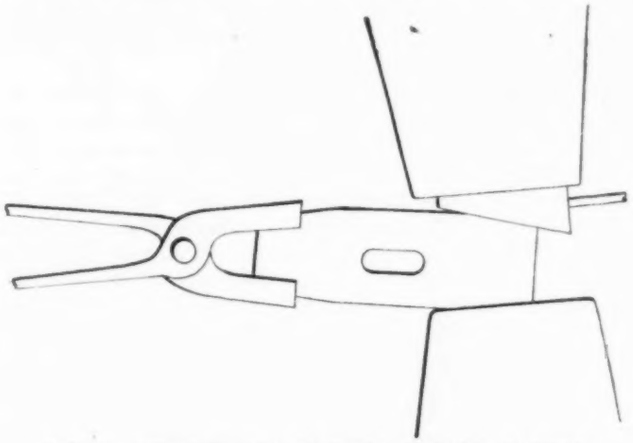


FIG. 9. METHOD OF DRAWING SLEDGE TAPERS

been made, in comparison with the die inserts, to insure them against the possibility of breakage. Heavy dowel pins *B* have been provided as an aid to keeping the dies in correct alignment. In operation the smith feeds the hot bar into the wider or front end of the dies, giving it a quarter turn between each blow, and feeding it rapidly back as the imprint is deepened and worked to greater length. When fully formed, a slight further advance carries the end to the hot chisels *C*, where it is trimmed. At the same time a bevel edge is formed on each wing of the star by the bevel *D* behind the hot chisels, so that only a small amount of filing is required to put the cutting end in shape for use.

Rivet sets for air hammers are forged from bar

FIG. 10. PUNCHING HOLES IN SMALL SLEDGES

stock under a Bradley hammer using a set of two-pass dies. The first pass is used for breaking down the stock and roughing to shape; and the second pass, shown in operation, Fig. 8, finishes the forging complete ready for shearing from the bar. The forgings require several machine operations for completion, including the turning of the shanks to size, turning to shape and grinding after hardening for an accurate fit in the "air-gun."

Small sledges and heavy rivet hammers are forged under a Nazel hammer. Special dies have not been provided for this work and in order to draw the taper on each side of the forging it is necessary to use a taper flatter of double the angle required for one side, as illustrated in Fig. 9. The hole is hot punched, and in Fig. 10 the helper is shown holding the die ready to slip under the forging so that the hot slug may be forced through into it. After punching a slightly tapered drift is driven into the hole, first from one side and then from the other so that the hole will taper in both directions, from the middle, and make it possible to attach the handle more securely.

Converting a Shaping Machine to a Power Hacksaw

BY J. A. RAUGHT

Some eighteen or twenty years ago a man with whom I am well acquainted had an old shaping machine that was so badly worn and so poorly designed that he had decided to consign it to the scrap heap; but being in need of a hacksaw he reasoned that in this old machine he had about everything necessary but the bow-frame. Therefore, he had one forged with a long bar and attached it to the left side of the rear end of the ram. A T-shaped forging fastened in the toolpost served as a guide for the frame of the saw.

Although several modern saws have been installed in this factory, the old-timer has never been displaced because of its capacity, its accuracy and ease of manipulation.

Notices and Claims Under Compensation Acts—II

By CHESLA C. SHERLOCK

The matter of reporting accidents having been disposed of in Part I, the equally important point of filing a claim for compensation is taken up in this article. The author brings out forcibly the need for close observance of the prescribed rules and points out some pitfalls for the unwary.

(Part I appeared in last week's issue.)

IN THE previous discussion we found that it was necessary under the workmen's compensation acts for the injured workman to give the employer notice of the accident or injury within a certain specified period of time fixed by law, varying in the respective states from 10 to 30 days. We found that this notice of accident or injury was a period of limitation and that it absolutely fixed a condition precedent, in the majority of cases, which must be complied with by the workman before he could hope to receive compensation for his injury.

In the present discussion we are to consider the decisions dealing with the necessity of the workman filing a claim for compensation upon the employer. And in order that the employer may not fall into the error so many people do, it must be remembered that the giving of notice of an accident is not in any sense the filing of a claim for compensation. They are two separate and distinct duties resting upon the injured workman and they are two very neccessary steps in the matter of going about getting a compensation award.

There is a period of limitation placed upon the time when a workman can file a claim for compensation, just as there is a period of limitation placed upon the time when he can give notice of accident or injury, and the reasons for this limitation are very similar to those given for the notice of accident.

This much is settled at law: The portion of the statute requiring the workman to file a claim for compensation is mandatory and it is absolutely impossible for a workman to hold his employer for compensation unless he has filed his claim within the time specified by the statute. Formerly the courts were disposed to treat this provision lightly and they did not hesitate to stretch a point in favor of the workman, but you do not find them taking any such action today. More attention is being paid to the technical provisions of the statutes, as is invariably the case in a well settled system of jurisprudence. In the beginning of things, we do not have the technicalities to notice that we do when the system settles itself into well ordered practice.

As in the previous discussion, the cases mentioned herein are all new, none quoted being more than two years old, and some have been decided within the last six months.

In Illinois the court held that the statute requiring claims to be filed within six months was mandatory and could not under any circumstances be dispensed with, and that no right of action in favor of the injured workman exists without proof that such claim was filed within the time limit fixed by the Act.

In a Michigan case it was shown that the injured workman had twice stated, in answer to inquiries by the Industrial Accident Board, that he did not propose to accept compensation, but expected to bring an action against the employer under the Federal Employer's Liabilty Act. No claim was filed until 13 months after the happening of the accident and then only after he had been denied recovery under the Federal Employer's Liability Act.

The court set aside an award of compensation in favor of the employee made by the commission, saying that the statutory provision relative to notice of claim within six months affected not only the right, but also the remedy of the employee. Said the court: "The condition of giving notice of a claim for compensation, controlling the right to demand the same, is clear. . . . Perhaps the legislative rule ought to be changed, a question for the legislature. But I can see no difficulty in such a case if the right to compensation under the Michigan law is preserved by notice, although the right may be doubtful. If the case falls within the Federal statute, the remedy under that statute is exclusive; if within the Michigan law, the Federal law has no application. But if a right under the Michigan law is claimed, notice of the claim must be given within six months after the injury is received."

When workmen find themselves in difficulty because they have been slow in making their claim for compensation, they naturally raise the question as to when the statutory period of time commences to run, as to whether it commences to run at the time of the accident or when disability first occurs. Here we find practically the same point arising that we did under the consideration of when it was necessary to give notice of an accident.

In a New York case it was shown that under the New York statute a claim must be filed within one year after injury, or the right to compensation will be forever barred. In this case the accident occurred on Jan. 10, 1916, and the claim was not filed until Jan. 10, 1917. The employer contended that the claim was barred, as in computing time reckoned by years the day from which the time is reckoned shall be included. The court did not so find, however. It quoted from the General Construction Law, which contained the following provision: "The day from which any specified period of time is reckoned shall be excluded in making the reckoning." So the court held that as the day from which reckoning must be made is excluded, it followed that the claim had been filed on time.

Employer Must Be Formally Notified

Again, we find the question of the knowledge of the employer entering in and raising a doubt as to whether it is necessary to make a formal claim for compensation when the employer already has knowledge of the workmen's intention to claim it.

In a Nebraska case it was shown that the employer had knowledge of the injury but that no claim had been made by the employee for compensation within the six months as provided by the statute. The statute required that notice of the injury shall be given "as soon as practicable after the happening thereof." The employee contended that no distinction was made by the

statute between giving "notice of injury" and "making" claim for compensation, and since notice was unnecessary when the employer had knowledge of injury, no claim need be made. The court, however, held that giving of notice and making claim for compensation were distinct and separate prerequisites to bringing an action for compensation.

Said the court, speaking of statutory provisions: "It is a statute of limitations, telling the claimant having a valid claim within what time he must prosecute it, if at all. The seeming contradiction in the language in that the employer appears to be privileged to begin the suit within one year, whereas the claimant's rights might be lost by his failure to make the claim within six months, exists, if at all, in the words, not the sense. Surely, no substantial right would be denied the employer, even if denied the right to commence an action to have settled a claim against him already barred."

Proof of Filing of Claim Necessary

Since the filing of a claim for compensation is a necessary step in the right to maintain an action for it, it follows that it is necessary for the party upon whom such duty rests to be able to offer proof that the claim was made in the proper manner and within the time specified by the statute.

In an Illinois case it was shown that a notice of claim for compensation was acknowledged by the general attorney of the employer on Nov. 6, 1913, and that the accident occurred on Oct. 2, 1913. The court held that the introduction of the general attorney's letter showed *prima facie* that the employer and general attorney received notice before Nov. 6, 1913. In the same case it was held that the production of the notice of the claim in the court on the demand of the employee's attorney positively proved that the employer or attorney had received notice.

In a California case it was shown that the applicant had, within six months of the injury, filled out an information blank concerning his injury, but had not filed formal application for compensation until after the expiration of six months.

The court annulled the commission's award, saying: "In the matter now before us the commission was asked to do nothing judicially by the request for a rating. That request sought no action on the part of the commissioners whereby they might bring the adverse parties into court or might acquaint themselves with the facts either from personal examination or by reports of their own experts. It did not ask that the employer or the surety be required to present any defense either might have, and, as a matter of fact, neither was called upon to appear and defend until many months later."

In a Massachusetts case the question was raised as to whether a claim can legally be filed by an attorney for the claimant. Said the court: "The claim for compensation filed by the attorney for the dependents on July 21, 1915 is the one relied on; and it complies with all the requirements of the statute. It states the time, the place, cause and nature of the injury; it is signed on behalf of the dependents by the attorney who represented them at the hearing, and it was filed within six months after the death of the employee."

In an English case the applicant claimed that she had filed her claim for compensation within the regular specified time by addressing and mailing a letter to her employer and that she had so addressed and mailed two separate letters. The employer showed that four clerks opened and sorted the mail as it came in and offered two of them to testify that no such letter had arrived. A search of the employer's files also disclosed that nothing had come. Lord Cozens-Hardy, M. P., who is the English authority on workmen's compensation, in trying the case, said: "No doubt a letter properly addressed and posted raises a presumption that it is received. It is only a presumption which may be easily rebutted."

While he seemed to have his doubts as to whether the letter had been in fact written and posted, he finally decided to resolve the doubt in the favor of the claimant and award her compensation, but he threw out a strong hint that it was going "against the grain" to do it and that henceforth more adequate proof of making claim would have to be offered.

The above quotation should be expressly valuable to American employers; the fact that it is from an English case does not alter the situation, as the courts of the two countries follow each other in their decisions. It simply means that while there is a presumption against the employer claiming not to have received the letter or the notice of claim, it is a presumption which may be easily overcome by proper showing, thereby shifting the burden of proof back on the employee claiming to have posted the claim.

In a Michigan case the question arose as to whether or not an oral statement of claim was sufficient to comply with the statute regarding claim for compensation. Said the court: "Giving the claimant's testimony the most favorable construction possible, it amounts to a statement that he would have to make a claim for compensation if he did not get better. We think this is not a compliance with the requirement of the Act."

It will be observed in this decision that the court does not say expressly whether a direct statement of claim would comply with the Act, but gives the inference that an oral statement, while it might pass the test, is to be frowned upon as the statutes obviously contemplate a written notice.

Very often where there has been a delay in making a claim beyond the period of time allowed by the statute, the workmen seek to set up some justification for their delay and to obtain a ruling from the courts admitting them to an award. The courts have been called upon many times to consider this question.

In a Michigan case it was held that because a workman had suffered a severe injury to his eye did not excuse his delay in waiting beyond the statutory time to file his claim. Said the court: "The six months limitation of time fixed by the Act for claiming compensation under it is plainly expressed, with no qualifications and no latitude given, by proviso or otherwise, to the board administering it for extension of time."

In another Michigan case it was shown that the workman suffered a severe injury to his eye but did not file his claim for compensation for more than 4½ years after the original accident had happened, claiming that he had not definitely lost his sight until within six months of the filing of his claim. The court held that while the words "accident" and "injury" were not synonymous the accident produced the injury, that in point of time they were concurrent, and that as the instant case was governed by such ruling the claim was barred.

This case is a clear-cut decision on the point as to whether the workman should file his claim for com-

pensation within six months of the accident or wait until he has definitely found out what the ultimate effect of the injury will be. Many people have the idea that it is improper to move for compensation until they know exactly what the maximum disability under the injury is going to be.

There is nothing that is further from the contemplation of the compensation acts than this feeling, and if they delay too long they are very apt to find themselves outside the pale of the law. The injured workman can file his claim for compensation within six months after the injury or accident and when his case comes on he will be awarded compensation in accordance with his disability as it appears at the time, or as it appears that it will be in a maximum sense in the future. One award does not forever bar future claims, if they are justified, as is the case in ordinary actions at law.

If it appears at some future date that a greater disability has resulted from the injury than was anticipated at the time the award was made, the workman can have the case reopened and upon a proper showing he can recover the additional compensation due him, while if he waits in the first instance to ascertain what this maximum disability is going to be before moving for his compensation, he will find that he has lost every right under the acts that he ever had.

The right to reopen a case also rests in the employer and if he feels that the workman has obtained a grant which is fraudulent or in error, he can have the case reopened and upon a proper showing have the original award reduced or increased, just as he pleases.

In a Massachusetts case the workman claimed that he first learned on Oct. 2, 1916, that he had permanently lost the use of his legs, due to an injury to his back, but he did not file his notice of claim until Oct. 30, 1916. It appears that there is no specified time limit in the Massachusetts act, but that the claim for compensation must be presented to the employer within a "reasonable time" after the injury. The court held that the claim had not been presented within a "reasonable time" after Oct. 2, 1916.

In a Michigan case the court said: "The language employed to effectuate this purpose, when read in connection with the context, is unambiguous and easily understood. It means, if it means anything, that the time shall begin from the day the accident happens and the injury is incurred. To say that the time does not begin to run until the claimant is fully advised as to the extent of his injuries, as is urged, is to import something into the section which is not there. The words 'after occurrence of the same' mean the same and are substituted for the words 'after the happening thereof' occurring in the preceding sentence with reference to the giving notice of the injury.

"If one means the day the injury occurred, the other does. It would hardly be contended that the 30-day provision for giving notice of the injury did not commence to run until some time in the future, when the injured party discovered the extent of his injuries. . . . The construction which the section should receive is that the time commences to run from the day the accident causes the injury. This construction is in keeping with the intent of the legislature to create a statute of limitations, and thereby fix a time when employers could feel certain that their liability in any particular case had ended."

This decision clearly establishes the rule, and it is being followed elsewhere, that the time for filing commences to run, either in the instance of the notice of accident or the filing of the notice of claim of compensation, from the day the accident occurred, the only difference between the two being that the legislature has allowed a longer time in which to file the claim for compensation than it allowed for giving notice of the accident.

In case of disability or death which prevents the claim being filed within the specified time, there has been some question, as the statutes in many of the states expressly reserve a longer period of time, not fixed, to those who are so incapacitated as to make earlier filing of claims impossible.

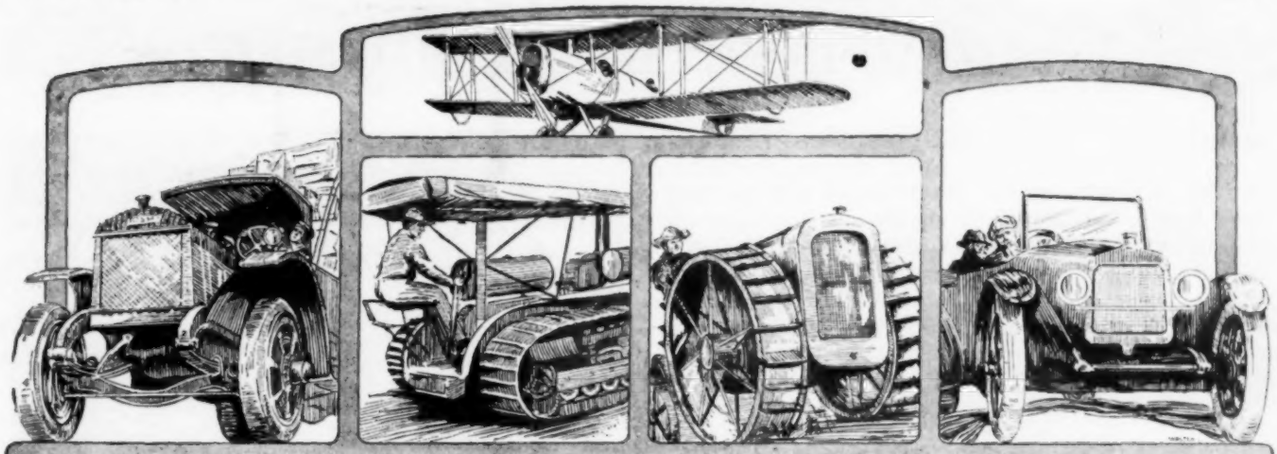
In Michigan the court said that in a case of death the claim for compensation should be filed within six months of the death of the injured workman. Said the court: "Under the plain requirement of our statute it was incumbent on the plaintiff to make claim for compensation within six months from Feb. 11, 1915 (date of husband's death). She having failed to do so, the award of the Industrial Accident Board appealed from was without jurisdiction and cannot be sustained."

This decision raises a point which goes to the whole root of the matter of claims that have not been filed within the limits prescribed by the statute. The court states that the Industrial Accident Board has no jurisdiction over a claim because it was not filed within the time limit specified by the Act, and this is exactly what the failure to file within the time specified does to all claims that might otherwise be valid.

The legislature has expressly limited the jurisdiction of the Industrial Commission to those claims which are regularly and properly filed, and unless these prerequisites have been followed, the Industrial Commission has no jurisdiction of the case, and indeed no judicial authority has any jurisdiction over the matter so as to impose an award upon the employer. There must be some limit to the authority of the commission and as to the liability of the employer, and it might as well be here as elsewhere. It is not necessarily suggested that employers should take advantage of these technicalities in order to defeat their just obligations under the compensation acts, but it is suggested, in the interest of all compensation claimants, that the employer insist upon a speedy determination of every case, and if claims have to be filed, the employer should be interested enough in the matter to insist that those entitled to compensation should file them within the time and according to the manner specified by the statute.

In the great majority of cases it is of no consequence to the employer, from a financial standpoint, as most employers are insuring their risk elsewhere and since they are paying premiums to protect their employees they should be interested in aiding the employees in every instance where it is warranted, in getting the compensation to which they are rightfully entitled. And the duty devolves upon the employer to advise the injured workman or his dependents as soon as possible after the accident as to their rights, and particularly to inform them as to the technicalities of the compensation statutes which are so apt to prove dangerous pitfalls for the unwary.

There is nothing more pitiful than an injured workman deprived of his usefulness as a wage earner, or helpless dependents who have lost their award because of ignorance of the law.



AUTOMOTIVE CONSTRUCTION

Machining Over 200 Cylinder Blocks Per Hour

By FRED. H. COLVIN
Principal Associate Editor, *American Machinist*

The large number of cylinders required for the Ford output necessitates as well as makes possible the introduction of unusual methods. The methods described and illustrated make an interesting study, particularly when it comes to deciding how far they can be used on smaller outputs.

THE machining of over 200 cylinders per hour, with a total output of over 3,400 in a 16-hr. day, makes it necessary to provide rapid and convenient means of handling the cylinder blocks between operations. Fortunately, the block is comparatively light in weight and can be handled by one man without difficulty. The main problem is to bring a constant supply of castings to the machines as needed, and also to provide means for passing them to the next operation without congestion or loss of time.

Fig. 1 gives a general view of the conveying system used in the cylinder department and shows how a steady stream of castings flows past the milling machines, which perform the first operation. Each cylinder block is mounted on a small four-wheeled truck which is carried by a loosely connected chain so that no difficulty is experienced in rounding the corners, the truck simply making contact with the raised guards on the outside. This conveyor is raised from the floor and supported on uprights so as to pass over the tables of the milling machines and to allow pas-

FIG. 1. CYLINDER MILLING DEPARTMENT, SHOWING CONVEYOR

AUTOMOTIVE CONSTRUCTION

sage underneath where necessary. Rope hoists are also provided for each machine to handle castings, in loading them into place in the fixtures in which they are held. These hoists are supported on the overhead I-beams built up by the uprights and angles as shown.

Some idea of the main operations can be had from the transformation sheet, Fig. 2, in which the numbers correspond to the figure numbers in the article. However, only about a third of the total operations are shown on this sheet. The first machining operation is

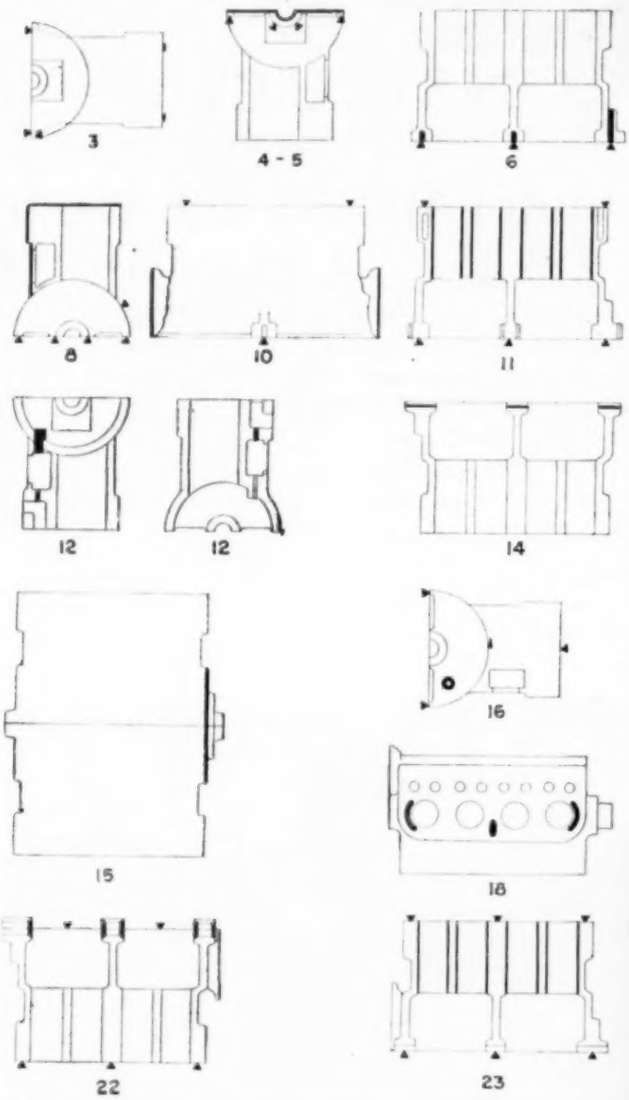


FIG. 2. TRANSFORMATION SHEET FOR OPERATIONS ON FORD CYLINDERS

to mill the four locating points shown at *A*, *B*, *C* and *D* in Fig. 3. These are projections cast on the top of the cylinder block which are afterward milled off in operation 4. They serve, however, to locate the cylinder block for the main operation of milling the base flange and the crankshaft-bearing seat.

The top of the cylinder block is placed under the yoke shown, with the locating points toward the milling cutters *E* and *F*, and the edge of the cylinder block resting on the hardened-steel strip *G*. The clamping plate *H* fits along the base flange, forcing the flange against two locating points, one being shown at *I* and the other hidden by clamping plate *H*. This locates the bottom flange so that the four locating spots are milled parallel with the flange. All four spots are milled at one setting.

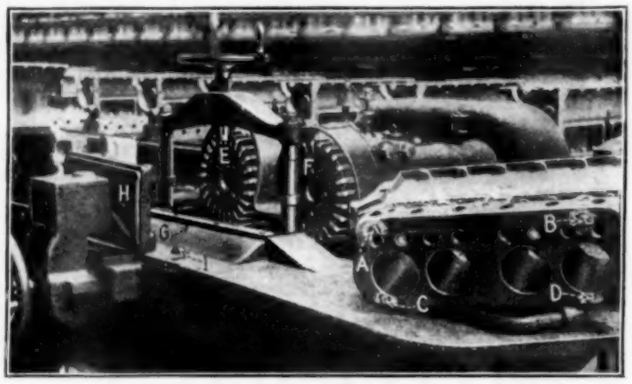


FIG. 3. MILLING FOUR LOCATING SPOTS

Resting on the locating points just milled, and also centered by the outside of the end bearings in the V-blocks *A*, *B* and *C*, Fig. 4, the cylinders are bolted in large gangs to the table of the planer-type milling machines shown. Details of the fixture and the work done are shown in Fig. 5.

The construction of the fixtures is shown in Fig. 5 as well as the self-clamping tongs for lowering the cylinder blocks into position, the locating points for supporting the flange, and the guard around the milling cutters. It should be noted that these machines carry both vertical and horizontal cutters. The former face off the flange, while the latter, as at *A*, mill the half-round seat for the babbitt for the three crankshaft bearings. These machines carry 32 cylinder blocks, there being eight rows of four each. Each machine handles about 35 blocks per hour.

Next comes the drilling of the six bolt holes by which

FIG. 4. MILLING THE BASE FLANGE

AUTOMOTIVE CONSTRUCTION

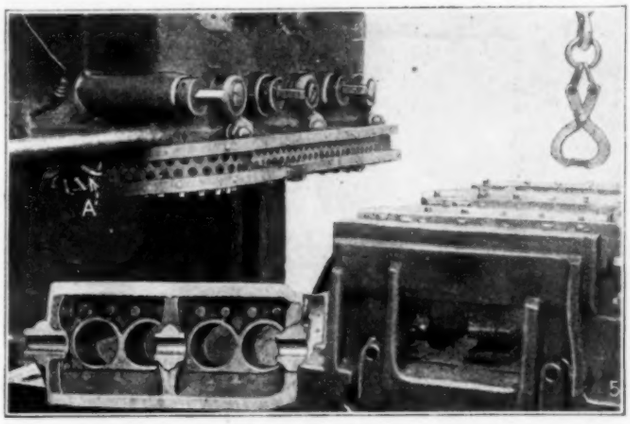


FIG. 5. DETAILS OF FLANGE MILLING

the bearing caps are held in position. These also serve as locating holes for future operations. This is done on a special drilling machine of the inverted type shown in Fig. 6. The arms *A* and *B* are simply for convenience in resting the cylinder block while it is being pushed back into position, the slides *C* and *D* supporting the outer end. The block fits this opening and is easily clamped in position by the handwheel *E*. When the cylinder is fully clamped, the cam *F* is out of the way so that the rod *G* can spring back in position and start the feed. This, however, cannot be started until the block is properly clamped. The head carrying the block then feeds down over the drills, each machine handling about 22 cylinder blocks per hour.

The two center holes are then reamed on the special machine shown in Fig. 7, these being used particularly as the future locating points. With the conveyor arrangement shown, and the ease with which these can

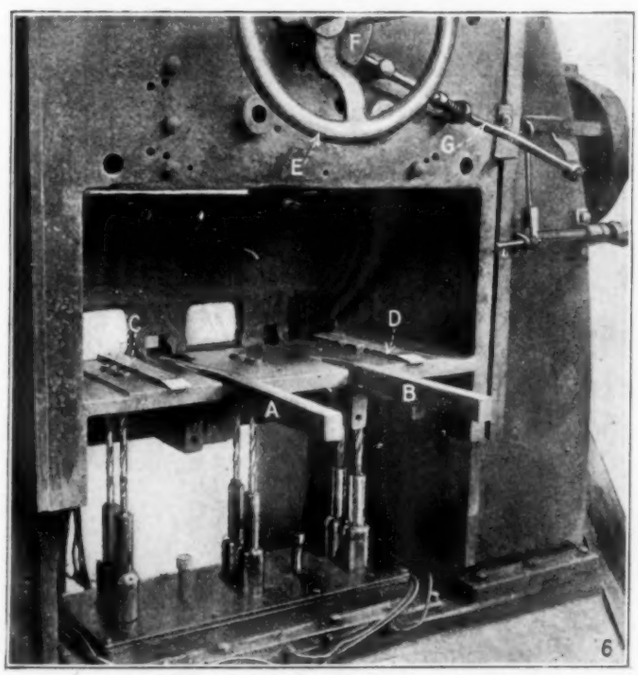


FIG. 6. DRILLING SIX BEARING CAP HOLES

be handled, this machine has a capacity of about 125 cylinder blocks per hour.

Then comes the milling of the top and sides, as shown in Fig. 8. This is not an unusual operation, and several types of machines are used on this work. The latest machine is a special one which carries 32 cylinder blocks at each setting, and handles about 43 cylinder blocks per hour.

The cylinders are then rough-bored on a special four-spindle machine, after which they are water-tested by the apparatus shown in Fig. 9. This is a double testing

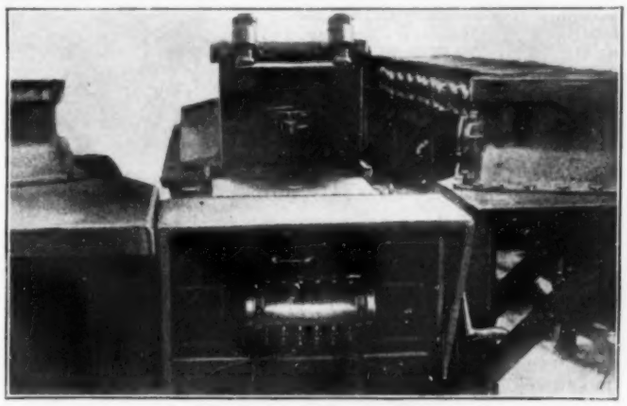


FIG. 7. REAMING THE TWO CENTRAL HOLES

stand and enables two men to work in very close quarters. About 50 lb. water pressure is used, and as can be seen, rapid clamping methods are provided so that the work can be handled very quickly. Each operator has a pump which enables him to apply pressure easily and rapidly.

Milling Both Ends of Block

Both ends of the cylinder block are then milled on the double-head milling machine shown in Fig. 10. This is a simple operation, the blocks being grouped in close order on a long table which passes between the two milling heads.

The second boring comes next, after which the third or finish-boring is done on the machine shown in Fig. 11. This operation also includes chamfering the upper end of the bore by means of the angular cutters shown on the boring bar, after which the valve-stem and valve-seat holes are roughed out as shown in Fig. 12. The first boring is done at the left and the reaming at the right. The racks for supporting the cylinder blocks are clearly shown between the two rows of machines.

Careful attention is paid to the valve-stem holes and the push-rod holes, both being carefully reamed within close limits. The valve-seat holes are cleaned out with an electric drill and are then rebored on special multiple-spindle drilling machines. Special drilling machines are used wherever it is advantageous to do so, two of these being shown in Figs. 13 and 17.

The machine shown in Fig. 13 drills 15 holes in all from three directions. The cylinder block is located by means of the guide rail *A* which fits the seats for the babbitt bearings, and the block rests on the hardened rails *B* and *C*. A cam action locks the cylinder in place.

AUTOMOTIVE CONSTRUCTION

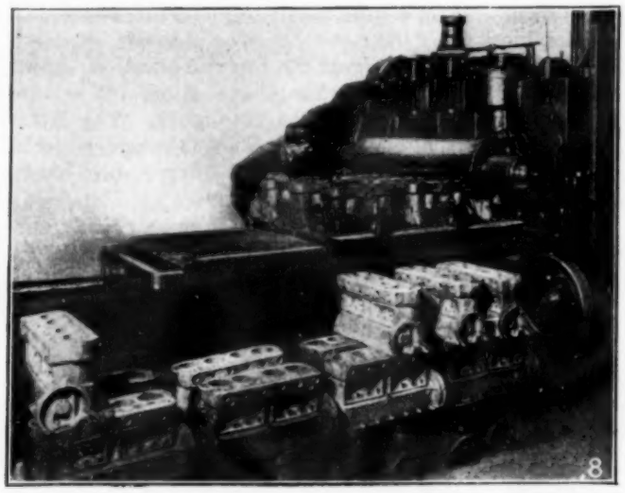


FIG. 8. MILLING TOP AND SIDES

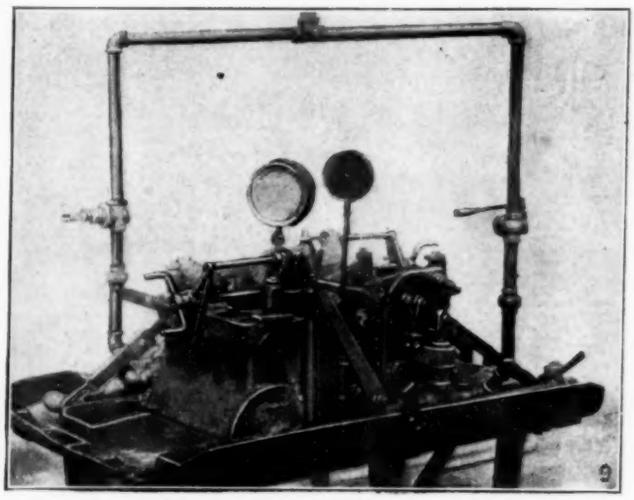


FIG. 9. DOUBLE FIXTURE FOR WATER-TESTING

The main bearings are next bored in the fixture shown in Fig. 14. The cylinder block is located by dowels and clamped down on to the steel plates shown by means of the clamps *A* and *B* which are operated by the lever *C* and the arms *D* and *E*.

The ends of the main bearings are finished with

FIG. 10. MILLING BOTH ENDS OF CYLINDER BLOCK

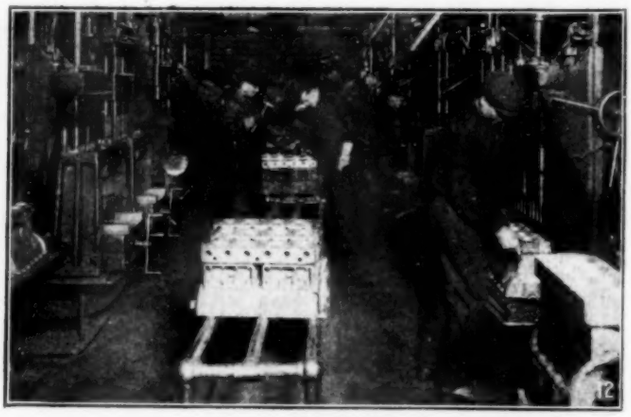


FIG. 12. DRILLING AND REAMING FOR VALVE STEMS

FIG. 11. REAMING CYLINDER BLOCK

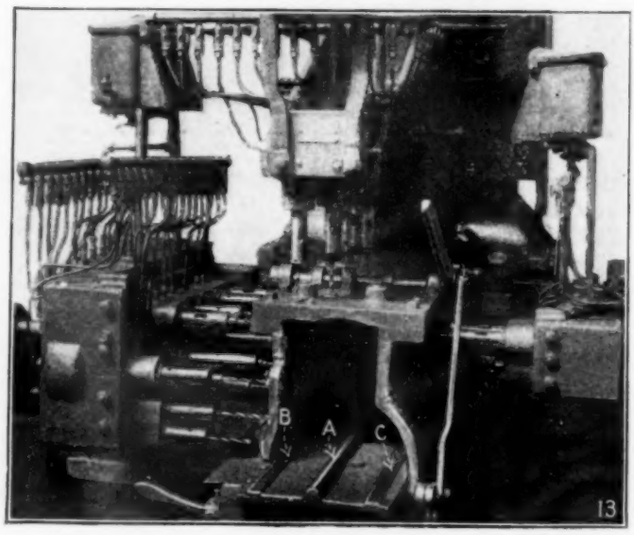


FIG. 13. A THREE-WAY DRILLING MACHINE

AUTOMOTIVE CONSTRUCTION

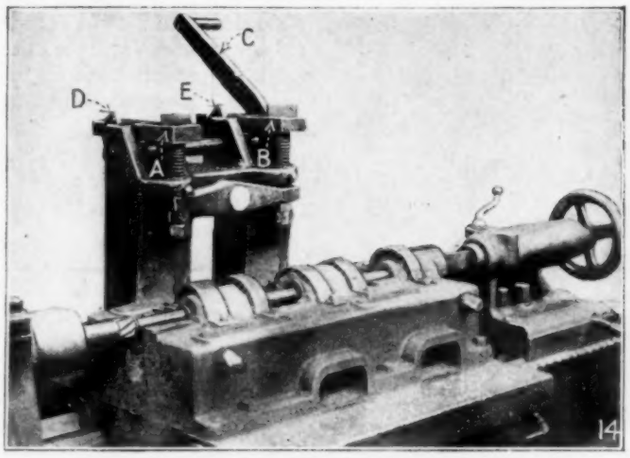


FIG. 14. BORING THE MAIN BEARINGS

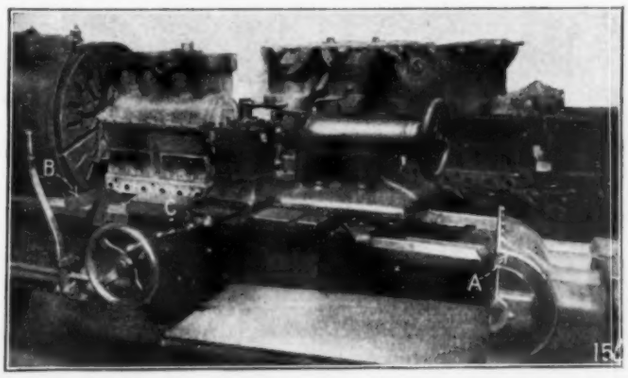


FIG. 15. TURNING END OF CRANK CASE

straddle-mills, after which the transmission end of the crank case is turned true with the bearings so that the clutch and transmission members will be exactly in line with the crankshaft. In order to insure the ends being perfectly square, two cylinder blocks are clamped on a mandrel which runs through the bearings, and both castings are driven between the lathe centers from the faceplate shown in Fig. 15. This enables two crank cases to be turned at the same time, the turned surface being shown at *A*, this being a finished cylinder block. The arm *B* and the pad *G* are simply for convenience in putting the work into the lathe, the turning operation

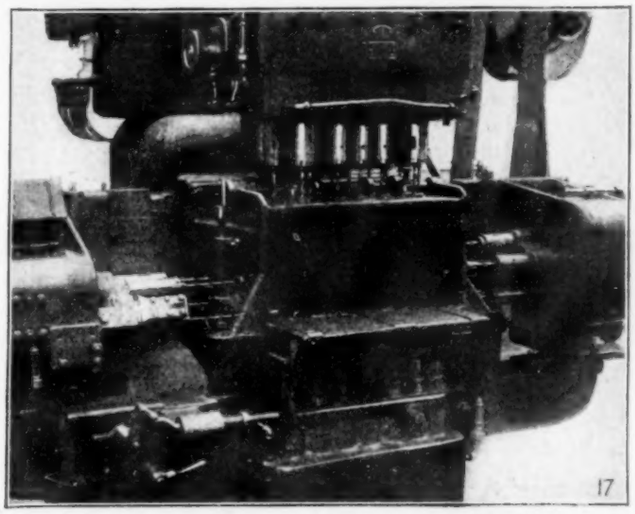


FIG. 17. A FOUR-WAY DRILLING MACHINE

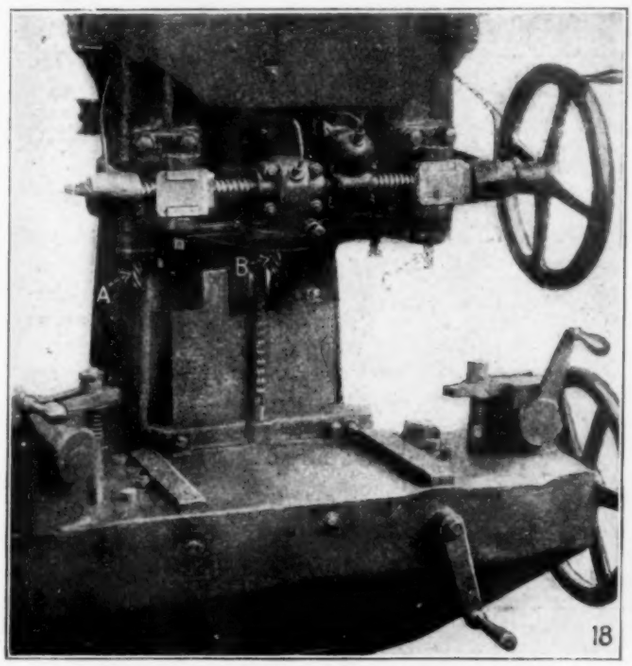


FIG. 18. MILLING THREE WATER PORTS

FIG. 19. BABBITTING THE MAIN BEARINGS

AUTOMOTIVE CONSTRUCTION

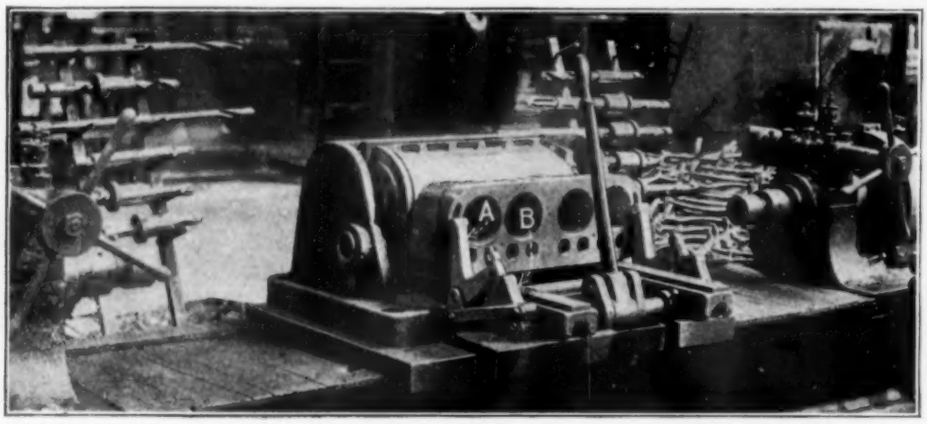


FIG. 16. BORING CAMSHAFT HOLES

being extremely simple, as can be seen. A special loading fixture is provided, and the toolpost carries four tools in a turret. These conveniences enable an operator to handle 22 cylinder blocks per hour per machine.

The camshaft holes are bored and reamed in the double-headed machine shown in Fig. 16. The cylinder block is located by the bearing bolt holes previously referred to, and clamped in position by the ingenious combination of bell crank and cam shown at *A* and *B*. The design is very similar to that used in the Ford transmission and is very effective. Eighteen of these machines are required, the capacity of each being 15 per hour. The simplicity of the fixture and the machine makes the method easily adaptable on smaller production.

The holes for anchoring the babbitt in the bearings are then drilled radially in the main bearing, after which the cylinder block goes to the special four-headed drilling machine shown in Fig. 17. This puts in the flange bolt holes, the holes for the cylinder cover studs, and holes at each end for the transmission and other attachments.

Then follows the spot-facing of the holes in the bottom flange and the counterboring of the six main bearing bolt holes, the drilling of two oil holes in the side of the cylinder, the clearance for the timing gear, and the drilling and counterboring of the holes for the water plugs, together with facing the crankshaft bearing bolt holes and spot-facing of the crankshaft cover holes.

The water slots are milled in the special three-spindle vertical milling machine shown in Fig. 18. This operation mills the three slots which make the water connection between the cylinder blocks and the cylinder head. Tho two outer slots are curved to conform to the bore of the cylinder, while the center slot is straight. The two outer milling cutters, *A* and *B*, are mounted in swinging arms so pivoted as to secure the proper radius, and a movement of the handwheel shown guides them over the full length of their travel. At the same time the central cutter *C* is moved across the cylinder to the correct distance. It will be noted that the milling cutters are of the new rapid spiral-tooth form.

Next comes the babbitting of the main bearing, utiliz-

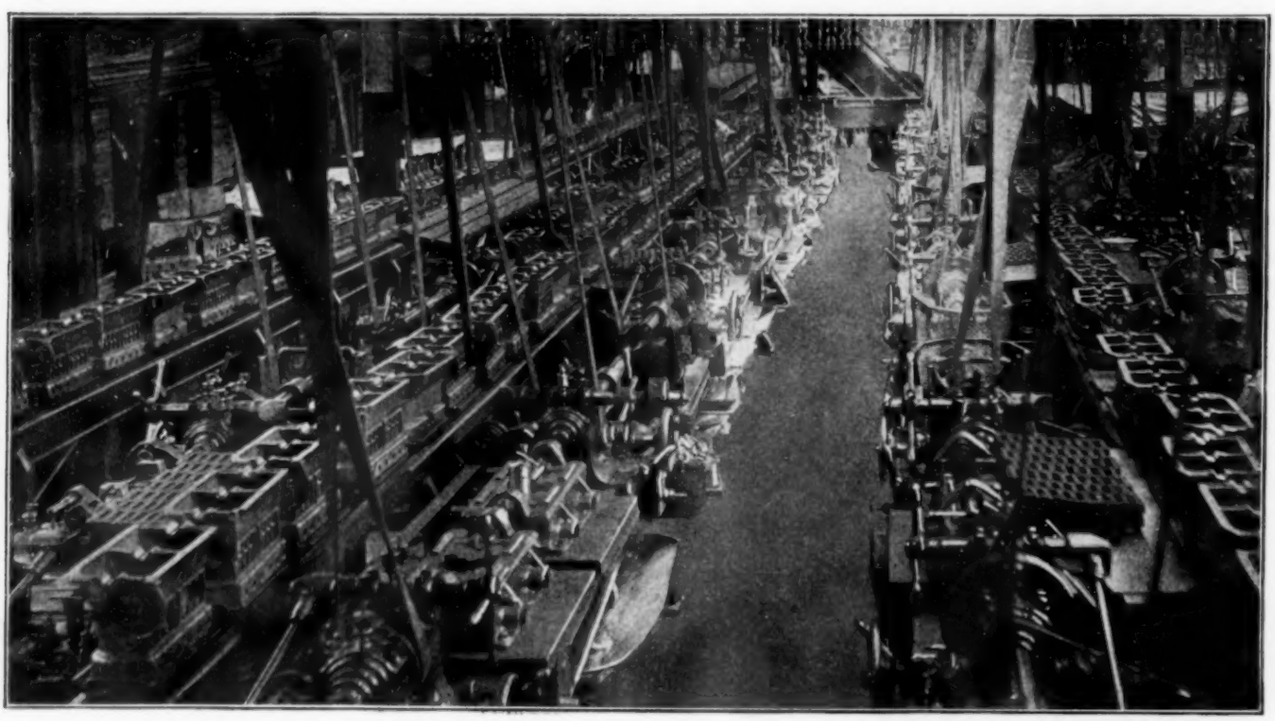


FIG. 21. LINE-REAMING THE MAIN BEARINGS

AUTOMOTIVE CONSTRUCTION

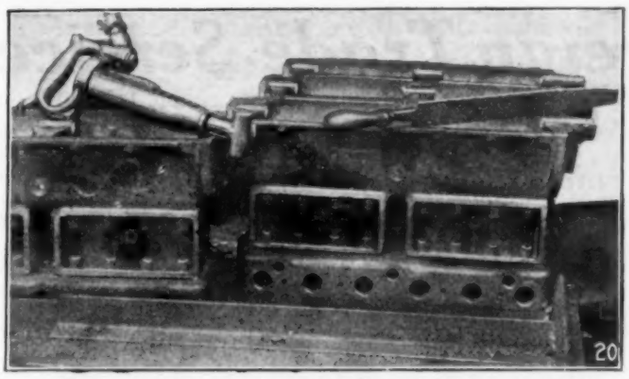


FIG. 20. PEENING AND TRIMMING THE BEARINGS

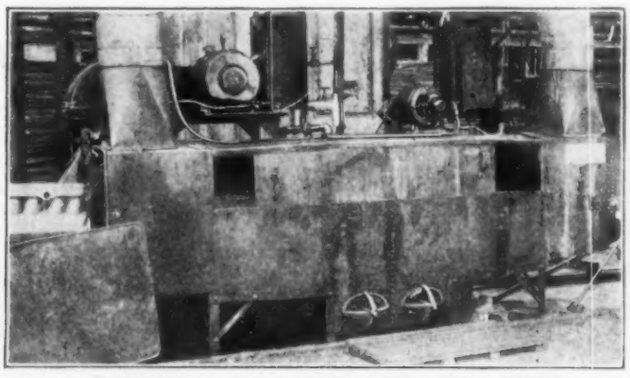


FIG. 24. WASHING THE CYLINDERS BEFORE ASSEMBLING

ing the fixture shown in Fig 19. With the cylinder block placed in position in the babbitting fixture, the arm *A* is swung down and locked into place at *B*. The blocks *C* and *D* form the cheeks or ends of the mold for the end bearing, while the pieces *E* and *F* form gates for guiding the babbitt down into the bearing around the mandrel *G*. The pin shown in the center acts as a guide and also forms an oil hole in the center of the bearing. Similar guides are provided for the other bearing and the counterweight *H* makes it easy to handle the whole thing rapidly. The surplus metal is then chipped off and the babbitt peened solidly into place by the pneumatic hammer shown in Fig. 20. The edges are also trimmed with the file shown.

Then the bearing caps are bolted into position and the bearings bored and reamed in the machines shown in Fig. 21. This also shows the conveyors on each side and gives an excellent idea of the compact way in which all the machines are located. The cylinders are then taken to the special milling machine shown in Fig. 22. The blocks *A* and *B* fit the bore of the first and fourth cylinders, while the strip *C* supports the cylinder block in the center. The cylinder is then raised so that the cutters at *D*, *E* and *F* come between the crankshaft bearings, the stops *G* and *H* limiting the upward movement. The main head is then moved sideways in both directions by means of a lever, and the ends of the bearing chamfered to the desired radius.

Instead of grinding as is done in most cases, the cylinders of the Ford motor are finished by rolling, as shown in Fig. 23. This is done on a heavy-duty four-spindle special drilling machine which carries the rolling tools, some of these being shown at *A* in the rack beside the machine. These are revolved and at the same time forced through the cylinders, being dropped out at the lower end. This compresses the metal and imparts to it a hard, burnished surface.

There remains a small amount of tapping to be done, after which the finished cylinder block is put on a conveying belt that carries it through the large washing machine shown in Fig. 24. Here it is treated to a scalding hot bath of soda water or some other mixture, and comes out entirely free from all dirt and chips, after which it is ready for the assemblers.

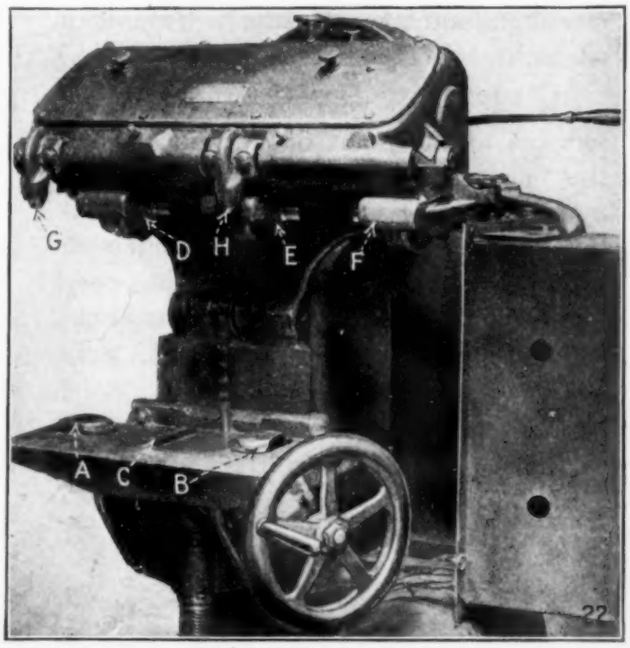


FIG. 22. CHAMFERING ENDS OF MAIN BEARINGS

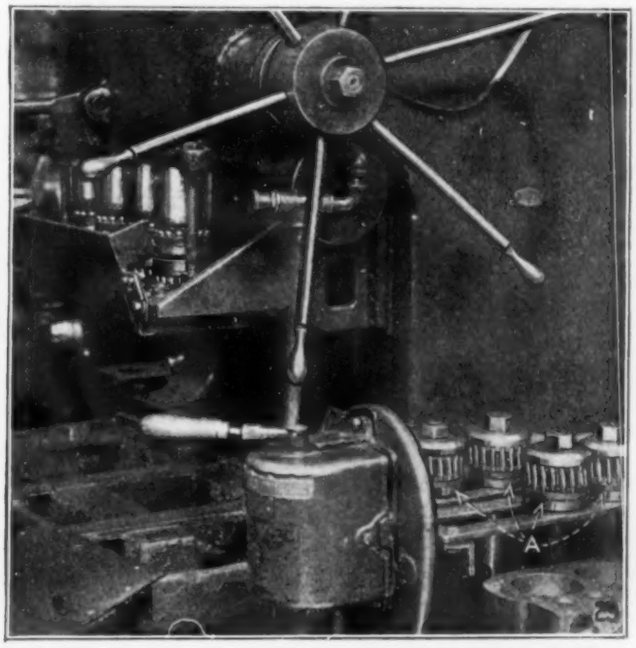


FIG. 23. BURNISHING THE CYLINDER BORES

Strangling Our Foreign Trade Service

NO more short-sighted, unbusinesslike and absolutely foolish piece of work was ever done than the cutting of the allotment for our foreign-trade service from $1,658,000 to $490,000 by the House Appropriation Committee which reported the legislative, judicial and executive bill out on February 19.

The original amount was small enough, but to have this cut to less than one-third is almost unbelievable — yet this is exactly what the Appropriation Committee has done.

J. W. Alexander, Secretary of Commerce, said in a special interview: "I do not believe the members of the subcommittee which decided to cut our appropriations for promoting foreign trade had any intention of crippling American commerce. The explanation of their action, I feel sure, is that they did not fully realize the part the Bureau of Foreign and Domestic Commerce has come to play in promoting trade."

This is certainly a very charitable view to take of the matter in the face of the fact that the Appropriation Committee undoubtedly knew that any cut in the appropriation was in direct opposition to the desires of the Chamber of Commerce of the United States of America, National Foreign Trade Council, American Manufacturers' Export Association, and hundreds of national and local business associations. It touches vitally the interests of every trade and industry. It is not economy any more than it would be for a farmer to cut to less than one-third the money he invests in necessary seed wheat.

Secretary Alexander goes on to say: "The cutting of the appropriations for the Bureau of Foreign and Domestic Commerce threatens a body blow at American export-trade development. It will mean the dismantling of the most essential part of our foreign-trade-promotion machinery at the very moment when England, Japan, Germany and France are leaving no stone unturned to increase the volume of their export business. Both England and France have just reorganized their foreign commercial service on a larger scale than ever before.

"Other countries are planning to do likewise. This is no time for the United States to throw into the discard the entire commercial attache service, almost all of the trade commissioners abroad, and the existing district and co-operative offices of the Bureau of Foreign and Domestic Commerce in fifteen American cities.

"It has taken years to develop these services to the point of efficiency which they now possess. The expenditure of money necessary to build up and maintain the field work of the Department of Commerce abroad and at home has been amply justified as I am confident thousands of American business firms, large and small, will gladly testify.

"Consider what this drastic cut in appropriations will mean: Twelve commercial attaches — men trained and ex-

perienced in commercial and economic matters — who are at present attached to embassies and legations in a dozen important foreign capitals where they are charged specifically and wholly with the promotion of American business interests at this critical period in the world's history will be withdrawn pre-emptorily within three months' time. At least fifteen trade commissioners, who are reporting on rapidly changing commercial conditions in European countries from Denmark to Austria, will have to be recalled by the first of May.

"A deliberate sacrificing of the finest foreign-trade-promotion machine any country has ever built up — one which half a dozen of our keenest competitors have sought to use as a model. The spending of money on constructive export-trade-promotion work, such as this Bureau is accomplishing, cannot be considered as an outright expenditure in any sense of the word. It should be regarded as an investment — based on the same common-sense principles which govern every individual business firm in the United States. It is so regarded by the Chamber of Commerce of the United States, by the National Foreign Trade Council, by the American Manufacturers' Export Association, and by hundreds of national and local associations of business men.

"In the same way the threatened abolishment of the Bureau's fifteen district and co-operative offices in New York, Chicago, Boston, New Orleans, San Francisco, St. Louis, Seattle, Cleveland, Philadelphia, and six other cities, will mean the elimination of a service which has demonstrated its usefulness in manifold ways.

"Each of these offices fills a genuine need in its particular district. Each office forms an important contact between the business public and the Washington headquarters of the Bureau for the dissemination of information on foreign-trade subjects. What will take their place?

"The Bureau of Foreign and Domestic Commerce is not a Bureau created by the war emergency. Its appropriations were not increased to take care of war activity and its personnel was not added to for the sake of carrying on the war-time work which is now no longer necessary.

"The Bureau has had a consistent growth over a period of eight years and there is every bit as much justification for the Government to aid and encourage by expert technical advice the American firms engaged in foreign trade as there is for the Government through the Department of Agriculture to aid and encourage the farmers of the country.

"Foreign trade is essential to preserve the economic stability of the United States. This cutting down of the appropriation for the Bureau means simply that the clock has been put back over four years.

"If the Department of Commerce in effect as well as in name is to be a department of commerce, it should be possible to increase the essential work of the Bureau of Foreign and Domestic Commerce rather than to have its activities lopped off to a point where it will be no longer possible to function properly."

All the enlightenment and influence you can bring to bear on your Congressmen will be needed to head off this pernicious legislation.

Business Opportunities in Asia

By F. R. STILL
Vice President and Secretary, American Blower Company, Detroit, Mich.

We have been hammering away at the subject of foreign trade ever since the armistice, but most of us have hardly thought beyond the limits of western Europe. This is very short-sighted, for the Near and Far East both offer golden opportunities for business. This statement from a man who has been there presents a clear idea of what must be done to win Oriental markets and also of some of the things that must not be done.

THE opportunity to do business in Japan, North or South China, Indo-China, the Malay Peninsula, the Philippines, Burma, Siam, Borneo, Sumatra, Java, Australasia, India and Ceylon varies in each of the countries named. The opportunity varies not alone as regards any one product, but it also varies as regards every American manufactured product.

An article which may be entirely acceptable in one country will not be so in another. Then again, there may be great business possibilities in one country which do not exist elsewhere; and very often, a method of doing business which in one country may have proved satisfactory, will be entirely unsuited to another. It is much the same as selling to an individual in our own country, wherein we all know that a variety of sales methods have to be employed to sell any specific article to the different people we encounter in various localities and occupations.

To do a successful export business in any oriental country, it is positively necessary to go there, carefully study the conditions, learn the requirements, temperament, habits and customs of the people and formulate a sales policy which will harmonize with what they are accustomed to; otherwise the business will scarcely amount to much, and besides a lot of money may be wasted.

To anticipate that a large or successful export business may be built up, simply through representation by any one of the many exporting houses in our country, or by the importing houses in foreign countries, is sure to result in disappointment.

The only possible exception is the sale of standard staple articles for which there may always be a heavy demand, beyond the natural sources of supply.

No manufacturer of machinery or specialties can ever hope to make much progress without having a competent resident representative on the ground to assist an importing agency, no matter how large or experienced the agency may be.

Undoubtedly the best arrangement is to select a good live importing house, having ample capital, credit and an organization capable of handling the business, regardless of volume. With this house, place a competent representative to look after the particular interests of the home office, who is to work with the agency's staff along the lines which have proved successful in building up its general business. He must have a thorough knowledge of all branches of his own line, have the initiative to tackle any problem and be possessed of such judgment as will enable him to handle the business successfully, independent of advice from the home office.

The distances are vast in those countries, transportation and communication facilities very limited and exasperatingly slow. Hence he must largely rely upon his own resources and be prepared to act promptly, decisively and correctly without guidance. Naturally this calls for a man of exceptional experience and ability. Because such men are hard to get they are not usually sent to the Far East and that is why so many concerns are not satisfied with the results they get from their efforts to build up an export business.

To make clear why these statements are true, let us consider, first North China, say from Shanghai north to Siberia. Along the southern section of this area lies the great fertile Yangtze Kiang Valley, extending west over 3,000 miles. The tributary rivers are navigable for more than 1,500 miles, passing through the most highly productive agricultural district imaginable. All kinds of minerals abound north and west of this valley. It is reported that about one-eighth of the world's coal supply is available in this part of China alone, of which less than one per cent has been developed.

There is ample labor available and of a class of intelligence far above that possessed by most of the immigrants who come to this country from Europe. The people can be taught to do anything and are possessed of a natural skill which readily converts them into finished mechanics or artisans in a very short time. It is their natural bent to do nice, neat work on anything they undertake. The greatest fault found with most of them is that they are too painstaking, thereby slowing up production when engaged in reproductive manufacturing pursuits.

Excepting in the treaty ports, of which there are perhaps a dozen, the people live in a primitive manner, not much different than they did a thousand years ago. Their wants are few. In the summer the people go

almost naked and in some sections the men do go entirely so. None of them wear boots or shoes, such as we are accustomed to. Woolen clothing has never been worn; only cotton and silk. In the cold, northern parts of the country they pad their clothing and wear several thicknesses in winter, binding their feet in gunny-sacking, tied on with bamboo reeds.

None of them have stoves or furnaces for heating their houses, as fuel is too scarce to afford such a luxury. A brick furnace is built for cooking and the smoke flue is carried under a "Kang" or bed which is usually about 9x12 ft. and built of brick. This "Kang" radiates all the heat ever provided and the whole family sleeps on top of this brick bed. The fuel is usually nothing more than dried stalks, weeds, leaves, etc., gathered from the fields, as there is no wood in China and very little coal is mined.

South of the Yangtze Kiang Valley the climate is so mild that heat and clothing for human comforts are not required. Shanghai is in about the same latitude as New Orleans, while Hong Kong and Canton are on about the same parallel as Vera Cruz, Mexico.

Working Up Trade in China

When working up trade in China, the manufacturer, jobber, exporter or importer seldom, if ever, comes in contact with the purchaser or ultimate consumer. Practically all business is done through a "Comprodore," who is a highly educated Chinese business man of means; he assumes all financial responsibility and guarantees that the customer will pay for the product according to the contract or he will bear the loss. The "Comprodore" employs a number of Chinese salesmen or "scouts," who usually bring him in contact with the prospective purchaser. The house does all the engineering work, writes the specifications, makes the estimates and draws up the contracts. The "Comprodore" acts as the interpreter and intermediary, being in fact the salesman. He is paid a commission on all sales and in turn divides what he gets with his "scouts." Few Chinamen will deal direct with a foreigner at first. It is a Chinese idea that to approach a dealer for quotations indicates a desire to purchase which will preclude getting the best price. Two Chinamen know one another's tricky ways perfectly and can bargain and haggle for days with the keenest enjoyment over little things which would drive an Occidental crazy. Our definite, direct and impatient ways of doing business are not understood by any of the Oriental races, which, if for no other reason, makes it necessary to employ very different sales methods than are used in Europe or America. Hence the "Comprodore" system, while vicious in some respects, is apparently the best adapted to the peculiar characteristics of the people in that part of the world.

The "Comprodore" system prevails all over China and is more or less in vogue all over the Far East, especially where there are many Chinese. Most of the houses in India have a "Comprodore"; also those in Java and Sumatra. Even the European banks in China depend entirely upon a "Comprodore," and a Chinese "shroff" passes on all papers and currency.

Some houses have both an "Import Comprodore" and an "Export Comprodore"; then some have one or both in every branch office and a "Head Comprodore" at the main office.

The currency all over the East is on a silver basis. For many years previous to the war the fluctuations of exchange values were very small; hence, except in cases involving very large amounts of money the difference was not of serious importance. But since the war, silver has been climbing steadily until now it is worth more than gold. While climbing upward, it has frequently advanced two or three cents one day and then has fallen back one or two cents the next; occasionally it jumps six to ten cents in a day, one way or the other. This has made necessary an entire change in the methods of banking and in the carrying of bank accounts.

Watching the Silver Market

Every house now employs a "shroff," whose sole business is to watch the silver markct. He carries an account in one of the banks of every nationality represented in the country, like England, France, Belgium, Russia, India, Japan and America. As the exchange quoted by these different countries varies from day to day or even hour to hour, he draws from one bank and deposits in another.

There are no "clearing houses" in any of the Oriental cities. There are no national banks; most of the various governments do have banks of their own and issue their own currency, but usually the latter is circulating under a heavy discount. The currency issued by the foreign banks is generally the standard medium of exchange all over the East. It is a badly jumbled up mess and affords a fine opportunity for a loss of money through trickery, fraud, accidental oversight, or knavery. With half a dozen or more standards of value, all wildly fluctuating and no two fluctuating alike, they can produce ample confusion to satisfy the most satiated gambler if he is looking for excitement. But for a business house to attempt to contend with all these difficulties by direct representation through its own organization and expect to do a satisfactory business, anywhere near commensurate with the expense incurred, can only result in sore disappointment and eventual disgust with foreign business in every form.

Selecting the Man for the Foreign Importing House

If a manufacturer does not place a competent man with a foreign importing house, as suggested above, it is doubtful if much continuous business will be done, no matter what kind of a follow-up system be employed. Such importing houses handle so many things that it is more than can reasonably be expected that all of the lines will be given proper attention and all be pushed as they should be. Naturally such things as are in the biggest demand, which carry the most profit and which are the most easily handled, will get the most favorable attention; conversely, those things requiring careful attention, involving considerable risk and which have to be forced in order to move them, will only receive attention when a customer inquires about them, and even then will seldom be given the enthusiastic sales effort they would receive from a representative direct from the manufacturer.

Many interesting examples might be recited showing how the simplest things sometimes upset business dealings most disastrously, but space will not permit. It is absolutely necessary to understand thoroughly and be guided by the fact that most of the Oriental races are uneducated, bigoted, obstinate, prejudiced and superstitious; they are perfectly satisfied with their mode of

living; they do not want much and what they get they want as they have been accustomed to getting it for generations.

Hence, to try to change their ways so as to conform to our ideas is just as futile as to attempt to alter the action of the tides. We must learn what they want, how they want it and then provide it just as cheaply and uniformly as possible; we must carry on all business transactions in their way, expecting nothing unusual in the way of honesty or dishonesty from them and employ the same business methods for protecting our interests that we employ at home. If we follow these lines nothing can prevent the doing of a satisfactory foreign business in all lines, where there is a demand for goods offered for sale; and with close attention to the business, good goods, honest treatment and good service, it will grow continuously.

Turning a Ball on a Rod, and a Radius Dressing Device

By R. Coates

I have read in the *American Machinist* from time to time a lot of descriptions on the subject of turning spherical projections on, or depressions in, the ends of rods, and have been much surprised to learn what a lot of such balls and recesses the world must need in order to justify the enormous output from the various contraptions that have been devised for that purpose.

All the articles were interesting. Some were more convincing than others. Some convinced me that they had been hatched out of a fountain pen. If business keeps up along this line we will soon have all our bars of screw stock furnished with a ball on each end.

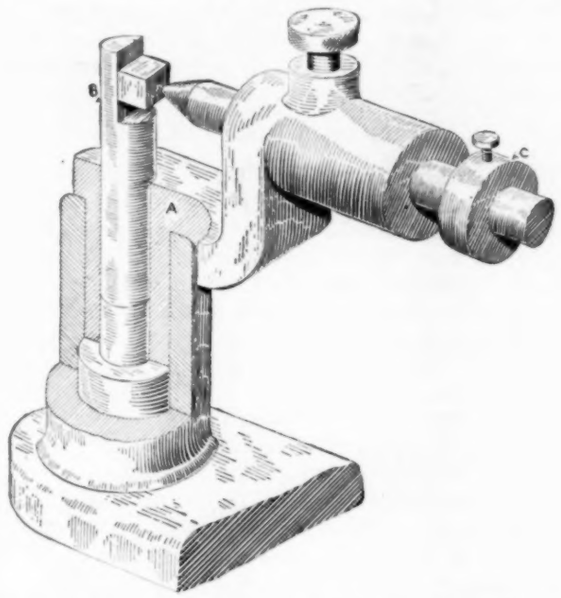
No! This is not an introduction to a treatise upon how to make a ball on the end of a rod. I have had very little experience along that line myself, and am not enthusiastic about them, although I will admit that

they are less destructive when so located than when they are projected (violently) from the end of a hollow cylinder.

Though my knowledge of the ball-on-a-rod business is slight, Mr. Dixie's article on page 743, Vol. 51, reminds me of the method used in one plant during the early stages of the war, to help along the work of grinding the ogee curves on the taper reamers used to produce some of the first cartridge receiving gages for French, English, Russian and Servian shells.

The reamers were first ground to the required taper on cylindrical grinding machines (I almost said grinders, but remembered in time that Mr. Norton objects to the term), the curves referred to being afterward ground on bench lathes with toolpost grinding attachments. The method used to form the grinding wheels was, with slight variations, substantially the same as Mr. Dixie describes.

The hand-tool-rest base that is part of the standard equipment of a bench lathe was used for the purpose of carrying a member that held a diamond holder horizontally and allowed it to pivot around a vertical axis. The drawing shows the action of the tool, but a brief description may help to clear it up. *A* is the machine-steel member, the shank of which is bored and reamed to receive the gage pin *B*, and turned to fit the hole in



RADIUS DRESSING DEVICE FOR GRINDING WHEELS

the tool-rest base. The elbow extension takes the diamond holder in a horizontal position and allows it to swing through any arc desired.

The gage pin *B* is a push fit in the shank of member *A* and its upper end is semicircular, the flat face being coincident with the axis upon which *A* turns. The illustration shows the method of setting the diamond to form a bead or convex surface on the wheel. To set the tool to turn a fillet or concave surface, the point of the diamond is brought to touch the flat surface of the gage pin and the size block placed between the collar *C* and the outer end of part *A*. The collar is then fastened by the setscrew, the gage pin pushed down out of the way, and the diamond holder advanced until the collar contacts with the boss.

This is not theoretical; I toted one for three and a half years through the big fight and it always did its bit when called upon.

That thing that looks like a lead pencil in distress is the diamond holder and the blob on the end is supposed to represent a diamond.

[We tried to have our draftsman reproduce Mr. Coates' drawing *fac simile*, but professional pride would not permit him to do so.—Editor.]

THE INDUSTRIAL RACE
WATCH YOUR STEP JOHN
LOOK OUT SAM!
DON'T STEP IN IT SAM
COMPULSORY METRIC LAW
HUN LINKS
AMERICAN MACHINIST
WORLD TRADE CLUB OF SAN FRANCISCO

Industrial Chile

By ERNEST L. LITTLE

THE country of Chile is one of the most peculiarly shaped of any in the world, extending about 2,600 miles along the west coast of South America and having a width of only 90 to 130 miles. All the northern section down to Voquimbo is an arid and desolate desert, without rain and vegetation, while the irregular land south of the Chacas Channel, between the island of Chiloe and the mainland, is practically uninhabited by white population. The real nation of Chile, therefore, lies between these regions, in the narrow valley between the Andes and the coast range. Here the hardy Chilean peasants, or rotos, the descendants of a vigorous race of Indians on the one side, and the Spanish conquistadores on the other, have extensively developed agriculture and stock raising, and have formed what is said to be the most homogeneous nation in South America. The population of Chile, according to the census of 1910, is 3,415,060 with an area of 292,580 square miles.

The principal source of wealth of the country has been the famous nitrate beds, which have furnished about 60 per cent of the national revenue. The prosperity of Chile depends to a very large extent upon the condition of this industry, and a lack of export demand for this product is reflected throughout the commercial and industrial activity of the country. The heavy cargoes of nitrate going to the United States and Europe have had an immense importance in building up the import trade. Not only do they bring in millions of dollars annually to the residents of the country but also supply freight on which vessels can count at all times for return cargo, thus simplifying the shipping situation.

Although Chile is a large importer of coal, large quantities are mined annually and supplied steamers for their outward voyages. The coal-mining companies have over $7,500,000 invested and produce 1,000,000 tons each year. This domestic source of power places Chile in a favorable position for the future industrial expansion of the country.

As an important corollary to coal in the development of the country, iron ore of excellent quality and to the extent of many thousand million tons is found in Chile. The ore is stated to run over 60 per cent iron with only a fraction of 1 per cent of sulphur and is very easily mined. The principal district now being operated is in the Province of Coquimbo.

While mining and stock raising and their related industrials provide occupation for a great majority of Chileans, there has been an increased development during the past ten years in manufacturing. With great quantities of iron, coal and timber, intelligent and energetic labor, numerous swift rivers for water power, and an interior nowhere far removed from the coast, Chile has become one of the chief manufacturing nations of South America, and it is quite possible that the factories may eventually rival the mines and farms.

According to the most recent statistics there are 5,722 manufacturing establishments, with 74,618 operatives and an aggregate capital of $94,257,466. The output of manufactures is valued at $107,007,418 annually.

Manufacturing centers around the Province of Santiago, which has about one-fifth of the entire number of establishments in the country with over a fourth of the capital. Valparaiso Province is next in importance and Valdivia third. The Chilean statistics classify the industries into groups according to their output and the number and capital of these are shown in the table.

Among the particular industries, that of shoemaking has the greatest number of establishments, but many of these are small. The shoemaking industry is most prominent in Santiago, but large factories are being constructed in Iquique and Valdivia. The leather used for the cheaper-grade shoes is the product of the Chilean tanneries, and this product is also used in the manufacture of trunks, valises, saddles and various other articles of leather. In the amount of capital invested the most important industry is that of grinding grain and other food products.

Although Chile must import the larger portion of its raw materials, the textile industry is growing rapidly.

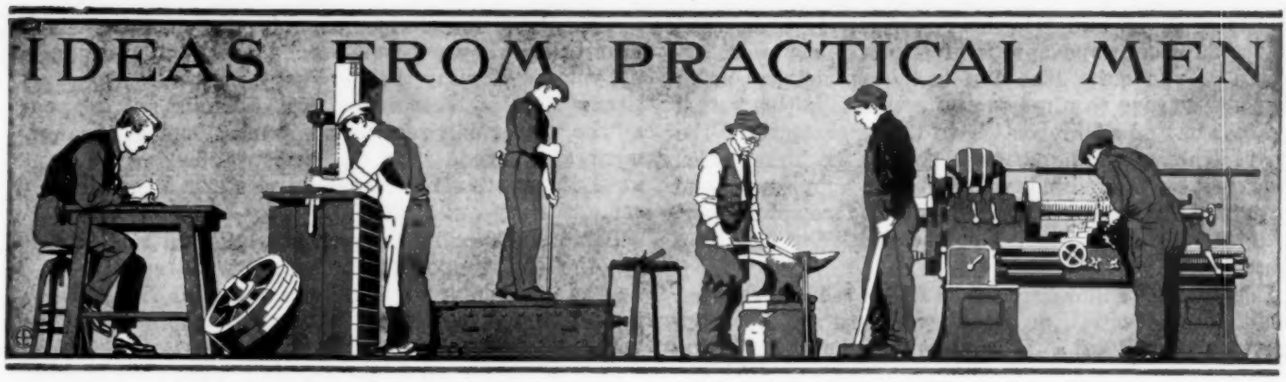
CLASSIFICATION OF CHILEAN INDUSTRY

Kind of Manufactories	Establishments	Capital
Alcohol, beverages, etc.	297	$8,222,433
Pottery, ceramics, and glassware	6	559,009
Foods and food preparations	807	27,601,757
Lighting, heating and combustibles	37	6,073,374
Dockyard and ship-repair stations	27	1,055,868
Clothing, etc.	711	5,869,542
Wood and manufactures	676	8,558,065
Construction materials	89	1,921,780
Textiles	32	3,508,027
Metals and manufactures	805	5,933,705
Furniture	189	1,155,970
Paper, printing presses, etc.	290	5,277,145
Hides and skins and manufactures	1,199	11,249,800
Chemical and pharmaceutical products	130	4,046,385
Tobacco and manufactures	98	986,076
Vehicles	188	1,063,565
Various	141	1,164,964
Total	5,722	94,257,466

The machinery for these factories came from England and a small amount from the United States.

Many industries will increase materially when better transportation and labor facilities render available some of the resources which are not being utilized. The manufacture of articles of iron and steel, although it includes a wide variety of products, such as railway materials, naval armament and other articles, will doubtless be further extended to machinery. While the increase in manufactures will tend to reduce the imports, it will, on the other hand, create a steady demand for hardware, tools, machinery and engines.

In order to introduce American products in Chile successfully, it is desirable for the manufacturer to establish connections with some import and native house with sub-agencies in each industrial center. This agency should have branches in Valparaiso, which is the chief port and commercial center of the republic, and Santiago, which is also a very large commercial center. With travellers covering the other large cities, the American exporter can be assured of proper representation. In the selection of an agent, great care should be taken to avoid granting a contract to a house representing competitive lines. A large number of importers of machinery and hardware have in the past been either German or English houses who are perfectly willing to represent an American house. Upon securing the exclusive contract from the American manufacturer, no attempt is made to merchandise his products, the American manufacturer in the meanwhile wondering why there is not a market for his products in Chile. By this policy, the Chilean importer keeps out a competitor.

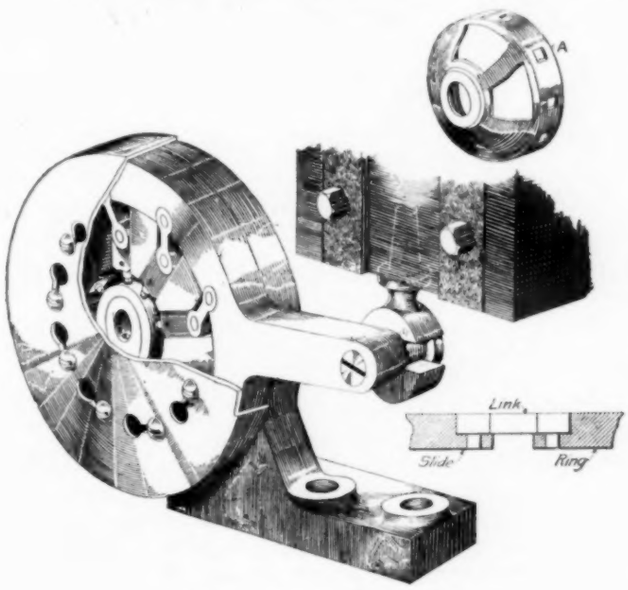


A Multiple Piercing Tool

BY AMOS FERBER

Some time ago our shop was manufacturing a large number of gas lamps, each having four burners and mantles, all the burners being supplied with gas and air through the central tube. The part called the air shutter shell was a cup-shaped stamping of thin sheet brass which required nine small rectangular holes to be pierced in its parallel walls as shown at *A*.

The tool that was first made to pierce these holes cut but one hole at a time, the die being attached to the vertical face of an angle casting arranged to go



A MULTIPLE PIERCING TOOL

in a foot press, and a latch located successive holes progressively, after the first one had been pierced until the work had been indexed around once and all holes pierced.

This tool did not give a satisfactory division, as whatever error there happened to be was cumulative, and if the shell was slightly bulged when the punch drew out (no stripper was used) the error would be worse. Many shells were scrapped and the operation at best was distressingly slow, so the tools shown in the illustration were designed and built.

The casting had a foot at one side with bolt holes for fastening it in the foot press in an offset position which brought the end of the operating lever under the center line of the press gate. The face and periphery of the round part of this casting was finished and nine rectangular channels milled in it, radiating from the center.

The operating cam ring was forged from machinery steel, bored to fit over the casting and faced to bear against the shoulder. This ring was finished all over. Slides to carry the punches were fitted to the radial slots, their outer ends being milled as shown in the small sketch to take the connecting links.

The connecting links were of mild steel $\frac{3}{8}$ in. thick and fitted closely to the counterbored recess in both slide and ring, the thrust of the operation coming upon these bearing surfaces. The pin in each end had only the duty of withdrawing the punch from the die.

A cover fitted over the tool and held all the parts in place. This cover had elongated slots in its face and was held by button-head screws, which were the only screws in the whole device except those that held the die and the small setscrews that held the punches in the slides. By loosening the cover screws and giving the cover a slight turn it could be lifted off, exposing the works, when any slide or connecting link, or all of them together, could be lifted out.

A hook in place of the usual punch in the press gate connected with the main pin in the cam ring so that putting the tool into the press involved no setting up other than sliding it into place and dropping in the two press bolts. The die was shouldered into the casting to locate it and held to place by two fillister-head screws from the back side. A tapered central hole through the die disposed of the piercings, the operator knocking them out with a lead pencil or piece of wire in case they piled up too badly.

There was but little movement to the slides and no adjustment, so it was necessary to keep the piercing punches of just the right length, but as these were but pieces of drill rod with the end milled to the right shape, a boy could make them up by the peck. They were left soft, as is not infrequently the case with small punches for sheet brass, and gave us no trouble at all.

A single sheet-metal shell of sufficiently heavy material for the cover would have been a very difficult job to accomplish, so the latter was built up from soft cold-rolled steel about $\frac{3}{16}$ in. thick and the joints made with hard solder.

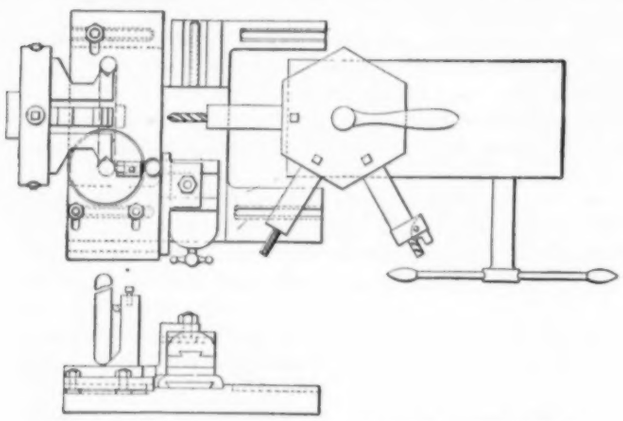
Device for Turning Handwheels

BY HOWARD M. BOGART

Turned and formed by ordinary methods, a handwheel of relatively large diameter and small bore is about as trying a job as one will find in the lathe department. We had a number of 6- and 8-in. diameter

wheels of $\frac{7}{16}$ in. and $\frac{1}{2}$ in. bore respectively to be used on the tailstocks and aprons of lathes. They were expected to run quite true and to be symmetrical as to shape. The care required to attain this condition raised the cost out of all proportion to the importance of the parts. The method had been to bore in the turret lathe, chucking by the outside of the rim; rough-turn and form in the lathe on a mandrel, using a faceplate driver, face the hubs on a plug arbor, and polish the rims in a speed lathe.

I devised the following method which reduced the cost about 60 per cent. Extension jaws were made for the universal chuck of a 16-in turret lathe to hold the



TURRET LATHE RIGGED TO MAKE HANDWHEELS

wheels by the inside of the rims, the V's in the jaws truing the wheels laterally. The rims were turned by a circular attachment bolted to the wings of the carriage. The attachment had stops allowing 1 in. transverse movement to adjust for the two sizes of wheels. The toolpost was carried on a gear driven by an idler pinion meshing in a section of rack attached to the cross slide. Operating the crossfeed revolved the tool around the rim of the wheel. The tool was shaped to present a broad face to the cut to cause the work to spring enough to allow for a fine finishing cut when the tool was fed back. After roughing the rim, the hub was bored, reamed, turned and faced with tools in the turret, the turning tool being fed back over the rim while the turret tools were working. The short side of the hub was faced and rounded in a drill press. The rim was then cut down on a concave polishing wheel, being allowed to revolve loosely on a stud to prevent flats being ground on it, and the polishing was done in a speed lathe. This not only produced a better wheel in shorter time, but avoided distortion of the hole by the mandrel.

A Homemade Boring Mill for Large Work

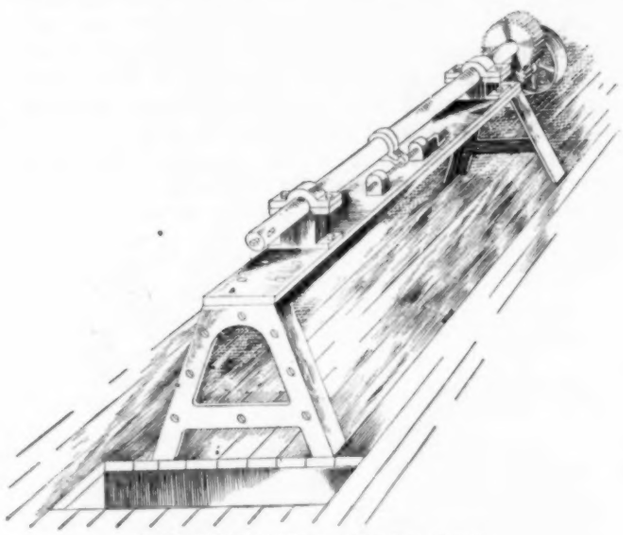
BY F. M. A'HEARN

The Editor's comment on page 1048, Vol. 51 of the *American Machinist*, regarding Mr. Homewood's statement about the platen running off the planing machine reminds me of a certain small machine which was subject to this complaint unless care was taken in placing work away from either end. It was also common practice to load down one end of the platen when planing a job with a heavy end, or one that overhung at one end.

This also brings to memory a type of machine where practically all work was overhanging and the adage, "If you can't swing the job swing the tool," was practiced. The sketch is drawn from memory and, as near as the writer can recollect, was the general arrangement of a crude type of horizontal boring machine used in small shops through western Pennsylvania some thirty years ago.

Some of these machines were built with A-frames for the end supports that brought the spindle to a height of about five feet from the floor line; others were of such height as to bring the spindle in line with an engine lathe. The latter type usually had a floor pit as shown in the sketch to take care of work too large to clear the floor. A number of holes in the vicinity of the business end of the machine furnished means of fastening work.

The feed arrangement was such as to furnish steady employment to the shop "cub" who, when the



THE IMPROVISED BORING MILL

tool was cutting, had to remain faithfully at his post of duty. All feed movements were inoperative when the cub discontinued turning the feed screw handle shown at the right of the bar.

The machine answered very well to the description of a pit lathe as given by a writer (Chordal, I believe) in the *American Machinist* back in the early nineties, when he said that, "The machine consisted chiefly of a belt, a few gears and a hole in the ground."

It was not much of a tool when compared with the modern "rapid fire" equipment which has superseded it; still it had the advantage of being cheaply built in the shop where it was to be used and it saved many a long haul over bad roads to the "big shop," a mighty convincing argument in itself. For, be it remembered that in those days improved highways were *not*, railroads were scarce, and the gentleman from Detroit, who builds the gasoline-propelled vehicle with an engine and a reputation, had not yet opened up his plant.

Work Together

Much of the unrest of labor is due to the fact that employers do not understand their employees nor appreciate their needs. Think well of your men and your men will soon think well of you.—*Manufacturers' Record.*

Right Things Wrongly Applied

BY P. A. FREDERICKS
Chief Engineer, Kempsmith Manufacturing Co., Milwaukee, Wis.

One meets occasionally with correct theory badly misapplied. An instance of this is the slides and gibs used on some milling machines in an effort to conform to the dogma of "narrow guides."

It must be admitted without reservation that a narrow guide or slide (meaning one narrow in relation to its length in the direction of traversing movement) is correct for loads applied in the direction of length, and especially for such loads when not central with the slide, because in such a case the tendency of the load is to

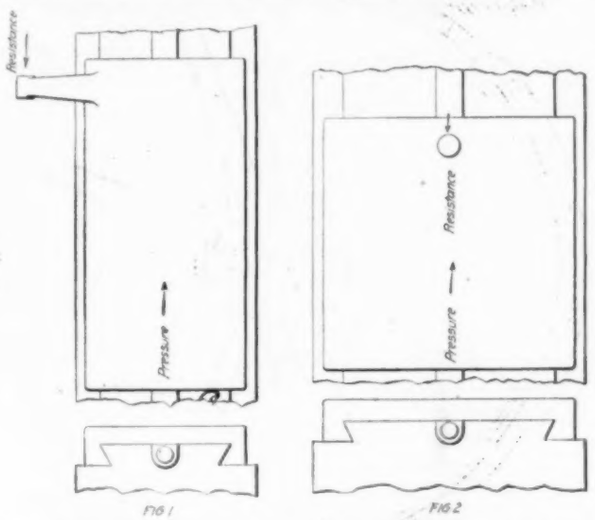


FIG. 1. WHERE PRESSURE IS ECCENTRIC TO AXIS OF LOAD, A NARROW GUIDE IS DESIRABLE. FIG. 2. WHERE LOAD DIRECTLY OPPOSES PRESSURE ALONG AXIS OF SLIDE THE NARROW GUIDE IS NOT NECESSARY THOUGH SOMETIMES DESIRABLE

twist the slide out of line with its guide, and the relative amount of such effect is, roughly speaking, determined by the running clearance, which is a fixed amount, divided by the quotient of the length over the width. Thus, as the length becomes greater and the width smaller, the final result or relative effect becomes less.

It might be noted that since the purpose of the "narrow guide" is to prevent twisting of the slide out of line, the same purpose might be served if it is possible to lo-

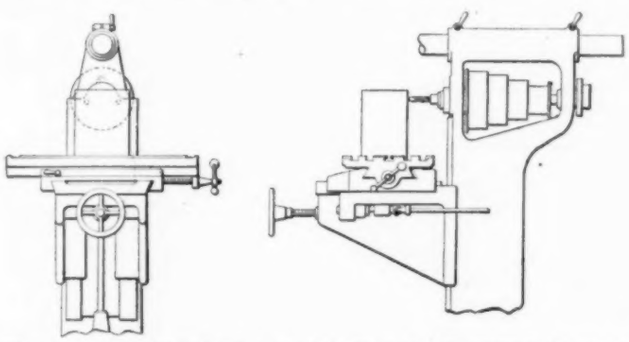


FIG. 3. IN THIS CASE A NARROW TABLE GUIDE WOULD NOT BE DESIRABLE

cate the slide central with the force. In this case the "narrow guide" becomes of small importance and it is only necessary to make the slide long enough to prevent cramping action. (See Figs. 1 and 2.)

Fig. 3 represents the conditions in a milling-machine saddle when the machine is used for drilling and illustrates an exact example of conditions in Fig. 2. This, however, represents only a very limited proportion of the work done on a milling machine—in fact, work probably never done on any other than a toolroom machine. Let us therefore consider the usual condition (see Fig.

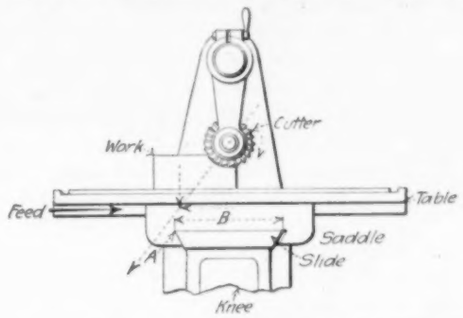


FIG. 4. ORDINARY CONDITIONS IN MILLING—IN THIS CASE THE PRESSURE IS AT RIGHT ANGLES TO AXIS OF SADDLE SLIDE AND A NARROW GUIDE IS UNDESIRABLE

4) where the machine is in use with a cutter on an arbor. The pressure in this case tends to tip the saddle as on a pivot at point *A* and the wider the distance *B* can be made, the more effectively this tendency toward tipping is resisted by that portion of the saddle engaging the slide on the opposite side.

Fig. 5 shows an attempt by the designer to avoid a wide slide while still obtaining a large effective resistance to tipping. Other things being equal, however, this design cannot be as effective as Fig. 4, because with any definite limit set on the width of the knee, the distance *B*, Fig. 5, must be less than *B*, Fig. 4.

Fig. 6 shows an attempt to obtain a "narrow guide" by means of square gibbing. This has two very noticeable defects. The first is lack of simplicity, there being three gibs to fit and keep properly fitted in place of one; the second is that the tendency to chatter is accentuated, for, while in Fig. 4 the horizontal component of the cutting pressure acting in conjunction with the angular surface of the slide, tends to pull down the saddle to a solid seat by sliding it bodily to the left, in the design of Fig. 6 there is no such pulling-down tendency. A certain amount of looseness must be provided in the fit of the slide, and, due to a tendency to tip or pivot around

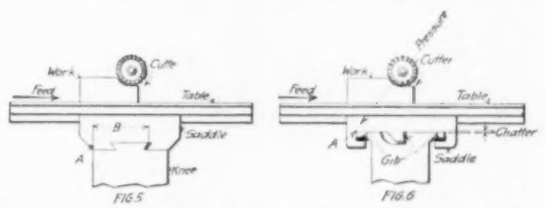


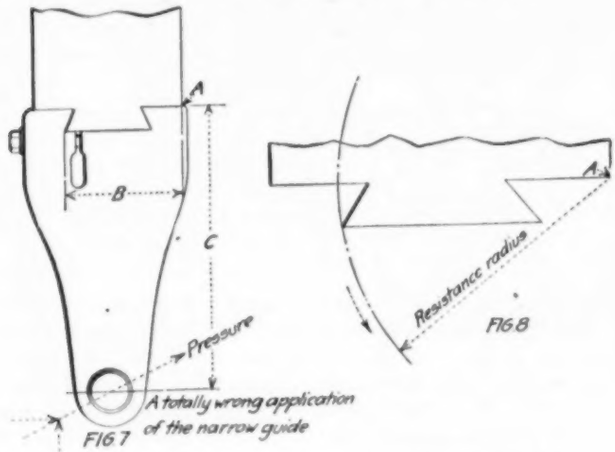
FIG. 5. NARROW GUIDE OBTAINED AT EXPENSE OF RESISTANCE DISTANCE *B*. FIG. 6. NARROW GUIDE OBTAINED AT EXPENSE OF SIMPLICITY

point *A*, this looseness is all transferred to the top of the knee between the knee and the saddle at the right as soon as the cut becomes heavy enough to overcome the unbalanced weight of the parts. Since this occurs intermittently as the cutter revolves, the result is a tendency to originate vibration or chatter.

Another misapplied "narrow guide" is shown in Figs. 7 and 8. In this case, distance *C* is great in relation to

that of B, and in consequence, the horizontal component of the pressure cannot act with the angular surface to force the two parts together as it does for Fig. 4; in addition to this, the metal resisting the turning or pivotal tendency around point A is very ineffectively placed to be of maximum service, being disposed at an angle to the resulting force so that the force actually gets a greater leverage against the effective resistance.

The above examples of poor conditions brought about by an effort to apply right things wrongly, are taken from present-day catalogs and advertising pages and represent efforts to improve upon earlier designs.



FIGS. 7 AND 8. WRONG APPLICATIONS OF THE NARROW GUIDE

Since no criticism is justified without an attempt to offer an improvement, the writer would suggest that in cases where the load is at right angles to the slide the principle of the "broad guide" be remembered to offset in our minds the principle of the "narrow guide." Fig. 4 represents an ideal condition, the only refinement apparently possible being to keep the cross-screw in the center where it belongs, and therefore the remedy for conditions shown in Figs. 5 and 6 is apparent.

Figs. 7 and 8 cannot be remedied except by a total change in the design, so long as width B is limited by the details of construction, which it apparently is.

Planing Wood Lagging to a Radius for a Pulley Repair

BY A. W. DILTS

A few years ago, while connected with a large manufacturing establishment in the East as master mechanic, I found it necessary to change a number of heavy drives from 36- to 48-in. belts.

The drive pulleys (which were mounted on a 12-in. diameter line shaft) were made up of two cast-iron spiders, as shown in Fig. 1, placed side by side with maple lagging bolted to them to make up the pulley rim or face. The spiders were 9 in. smaller than the diameter of the finished pulley and the maple lagging was 4½ in. thick. Fig. 2 shows the general dimensions of the lagging of which there were 80 pieces on each pulley.

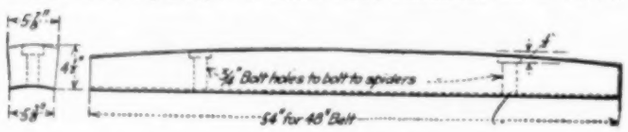


FIG. 2. THE LAGGING

In order to make the change with the least possible delay to the mill operation it was necessary to finish the lagging complete ready to bolt in place at the first convenient shutdown. This I did with the help of an old planer and the fixture shown in Fig. 3, which is a tilting fixture bolted to the planer table with a bearing on either side so it can tilt at a point representing the center of the lagging, which is shown in position. The fixture is connected by an arm to a taper attachment mounted on the inside of the planer housing at the proper angle to produce the required crown on the lagging. The table speed of the planer was reduced about one-half while in use on this job.

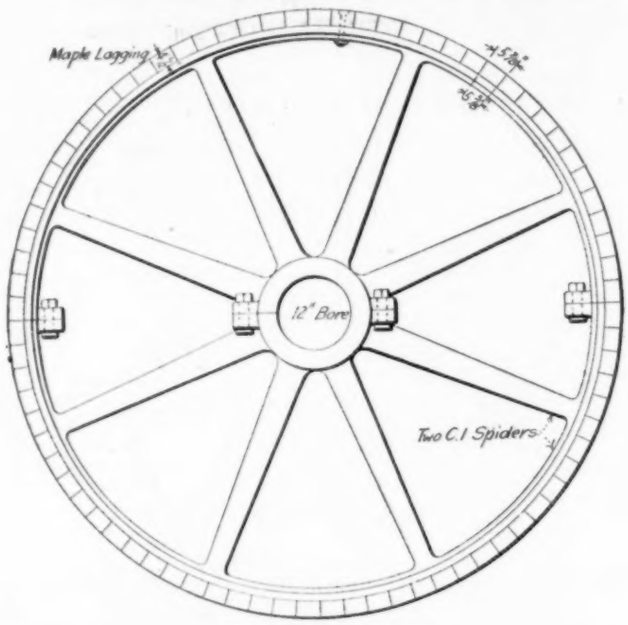


FIG. 1. THE SPIDER

The head of a wood-planer was mounted on bearings fitted to the cross-rail and driven by a belt from a motor located in front of, and just to one side of, the machine. This head was fitted with cutters having a radius equal to that of the pulley. The job was executed in a very satisfactory manner; the lagging was first sawed to shape and the bottom side concaved to fit the outside diameter of the spiders, then put in place on the fixture and, with one pass under the cutter, finished to size and with the proper crown.

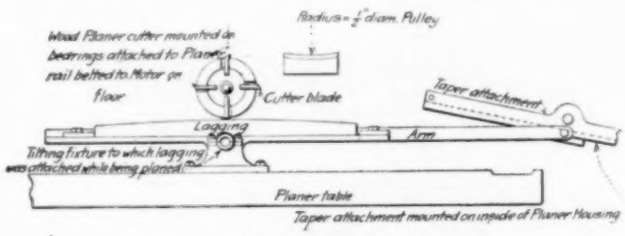

Radius = ½ diam. Pulley
Wood Planer cutter mounted on bearings attached to Planer rail belted to Motor on floor
Cutter blade
Taper attachment
Lagging
Arm
Tilting fixture to which lagging was attached while being planed
Planer table
Taper attachment mounted on inside of Planer Housing

FIG. 3. PLANING THE LAGGING

This is to me a new application of the taper attachment, and I believe it could be used to good advantage on other convex or concave work, as a wide range of curves can be generated by different adjustments of the taper attachment.

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Ryerson-Conradson No. 3 High-Power Milling Machine

The first of a line of machine tools being built by the Conradson Machine Tool Co. and marketed solely through Joseph T. Ryerson & Son, Chicago, Ill., is announced in the No. 3 high-power milling machine. This machine was designed to provide power, rigidity and convenience of operation which would adapt it to service for light and heavy manufacturing and jobbing work. The machine can be furnished in both the plain and universal types, as shown in Figs. 1 and 2 respectively. Its most striking feature lies in its helical gear drive the steadiness of which, it is claimed, will add to the life of a milling cutter. A sufficient range of speeds is provided for all regular commercial service.

The column is heavily ribbed internally, and is cast integral with the base, the latter being surrounded by a deep flange which both stiffens it and serves as an oil retainer. An unusual feature is the extension of the face of the column above the overarm to provide additional support for special fixtures.

Large bearing surfaces are provided on all faces of the knee, and, in the case of the column ways the bearing has been increased by extending the knee up to a point nearly level with the top of the table. The telescoping elevating screw is located at the center of gravity to avoid any binding action. The table has three T-slots and is surrounded by a large groove for retaining the coolant. The longitudinal table travel on the plain milling machine is provided with a handwheel extending diagonally from the side of the saddle, and on the universal machine this is replaced by a crank on the end of the table. The 60-point carbon-steel spindle runs in phosphor-bronze bearings, the front one being tapered, and both are adjustable for wear.

The drive, as shown in Fig. 3, is from a single constant-speed pulley, through a primary shaft which has the change gears on the other end that in turn drive a hollow shaft concentric with the primary shaft. This hollow shaft has two additional change gears and drives either the high- or low-speed set of helical gears on the spindle drive. This gives twelve spindle speeds, ranging from 17 to 290 r.p.m. The power from the driving pulley is controlled through a friction clutch that automatically applies a brake on the shaft when disengaged.

Eight changes of feed are obtained from the primary shaft by a chain and sprocket through a cone of gears controlled by a handwheel. Two sets of gears, operated by a lever, double the changes so that a total of sixteen feeds is obtained, ranging from 0.6 to 22.3 in. per minute. The feed screws are provided with dials read-

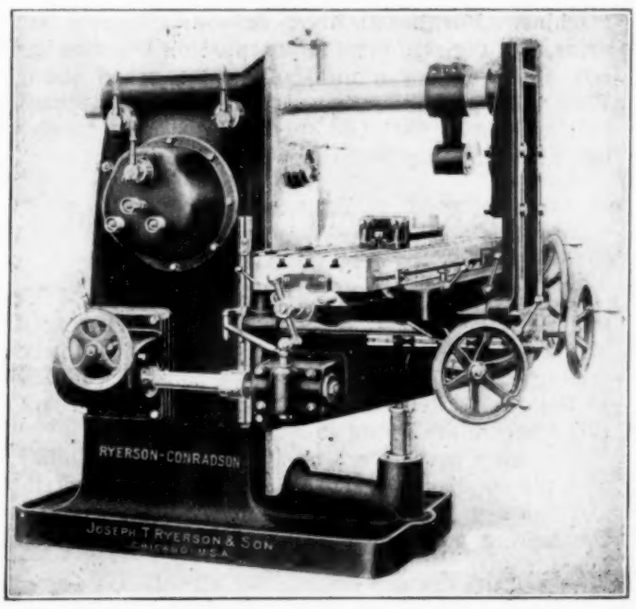


FIG. 1. THE RYERSON-CONRADSON NO. 3 PLAIN MILLING MACHINE

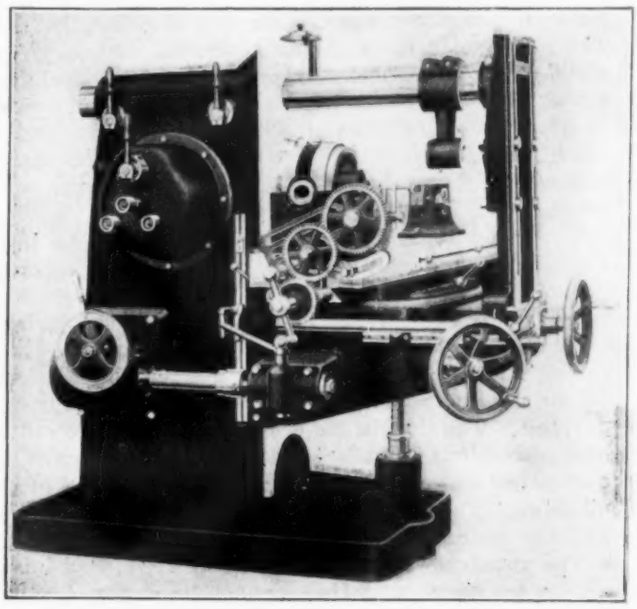


FIG. 2. GEAR-CHANGE SIDE OF NO. 3 UNIVERSAL MILLING MACHINE

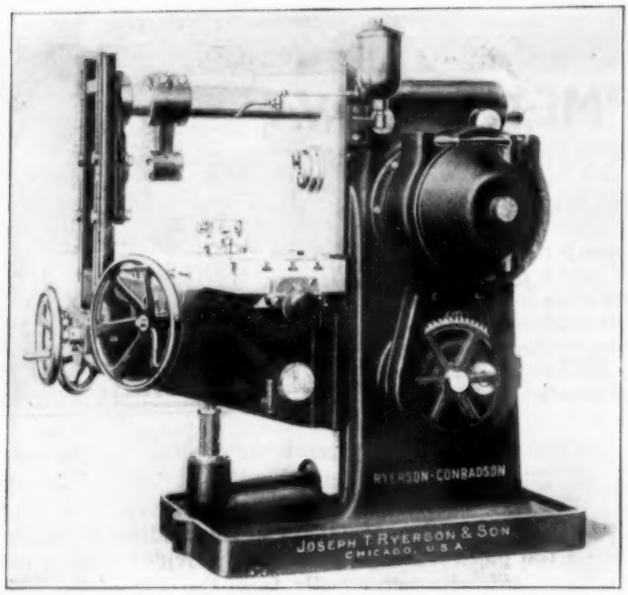


FIG. 3. BELT DRIVE SIDE OF RYERSON-CONRADSON NO. 3 PLAIN MILLING MACHINE

Specifications No. 3 Plain Milling Machine: Longitudinal movement, 35 in.; cross traverse, 14⅜ in.; vertical movement, 20 in. Front spindle bearing, 4¼ x 4¾ in.; rear spindle bearing, 3¼ in. Taper hole in spindle, No. 11 B. & S. Distance, spindle center to bottom of arm, 6⅝ in. End of spindle to arbor bushing, 27 in. Face of spindle to arm braces, 30⅜ in. Diameter of overarm, 4⅜ in. Table, 63¼ by 12¾ in.; working surface, 53 by 12¾ in. Twelve spindle speeds from 17 to 290 r.p.m. Sixteen feed changes from 0.6 to 22.3 in. per minute. Floor space, 76½ x 111 in. Pulley, 14 x 4 in. Speed, 600 r.p.m. Weight, 5,575 lb.

Specifications No. 3 Universal Milling Machine: Longitudinal movement, 34 in.; cross traverse, 13 in.; vertical movement, 18½ in. Weight, 5,910 lb. Other dimensions the same as the plain milling machine.

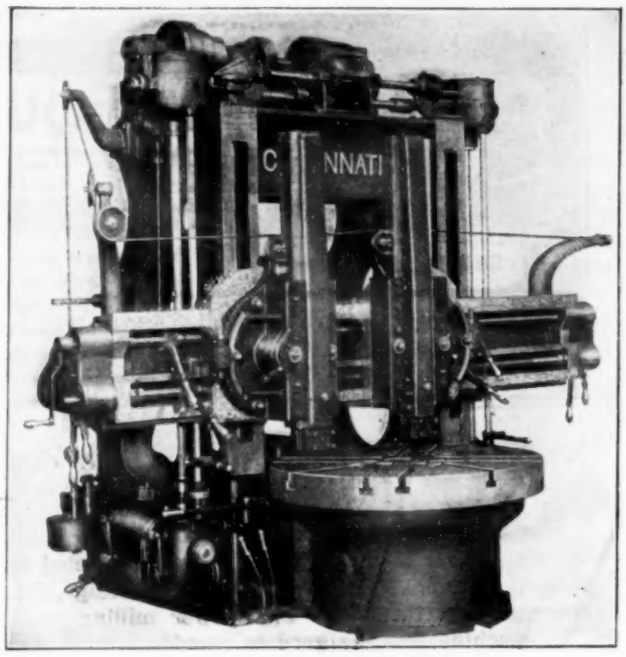
ing to thousandths of an inch. Fixed feed trips are provided for safety in addition to adjustable trips which will stop the table at any desired point. The change gears are chrome-nickel steel, while the other gears are either steel or bronze, and all are completely inclosed and run immersed in oil. All bearings are bronze bushed with the exception of the thrust bearings which are provided with SKF ball bearings.

Cincinnati Boring Mills

The vertical boring mill shown is a recent development of the Cincinnati Planer Co., Cincinnati, Ohio, The machine is made in two sizes, 42 in. and 48 in., and is classified as the "rapid-production bevel-gear type." It has a capacity for heavy cuts and coarse feeds usually found only in larger machines, and is heavily built to resist severe strain. The design follows closely to that of larger machines of the same make.

The table is driven by bevel gearing. The table spindle revolves in large angular self-centering ground bearings which do not extend below the floor line. The crossrail is arranged to be clamped both on the inside and outside face of the housing. It is raised and lowered by a power connection from the driving motor, no extra motor being required for this purpose. The heads have rapid power traverse in both directions, and are operated independently of each other and controlled by levers at the front of the machine. These levers are adjustable for height to suit the operator.

The rapid power traverse and the feed mechanisms are so arranged that they cannot be engaged at the same time. All gears are of steel and are entirely



CINCINNATI BORING MILL

Specifications: Sizes, 42-in. and 48-in.; swings, 44 in. and 50 in.; height under toolholders, 39 in.; travel of tool bars, 27 in.; diameter of tables, 43 in and 48 in.; diameter of spindle bearings, 8¼ in.; number of feeds, 8; range of feeds, ¼ to ½ in. per minute; revolution of table, 2.45 to 59.2 and 2.1 to 50.5 per minute; size of motors, 10 hp.; speed of motors, 500 to 1000 r.p.m.; weight of machines, 15,000 to 19,000 pounds.

inclosed. All bearings are automatically lubricated and the principal bearings are bronze bushed. The shafts and screws are made from high-carbon steel and are accurately ground. A safety device is provided in the feed mechanism to prevent breakage of gears in case of accident with the heads. The speed box is cast solid with the bed. Four speed changes are provided through positive jaw clutches which can be operated from either side of the front of the machine. An independent friction clutch on the first driving shaft is used to start and stop the machine. An automatic brake for stopping the table is operated from the same handle that controls the starting clutch. This, also, can be operated from either side of the machine. For belted drive or constant-speed motor drive, a three-step cone is mounted on the rear speed box shaft, giving a total of twelve speed changes. With the cone-pulley drive is furnished a mechanical belt shifter so that the operator need not touch the belt while shifting from one step to the other.

The Kempsmith No. 4 Vertical Maximiller

On page 595, Vol. 49, we described the No. 4 Maximiller, built by the Kempsmith Manufacturing Co., Milwaukee, Wis. The company is now making a vertical milling machine of the same general construction, known as the No. 4 Vertical Maximiller. Opposite views of this machine are shown in Figs. 1 and 2.

The main parts are semi-steel castings, designed to give the maximum strength. The column is well ribbed and has a web about half-way up, which both stiffens the casting and forms an oil reservoir for the speed gears.

The design of the knee duplicates that of the horizontal Maximiller, the top of which is without openings.

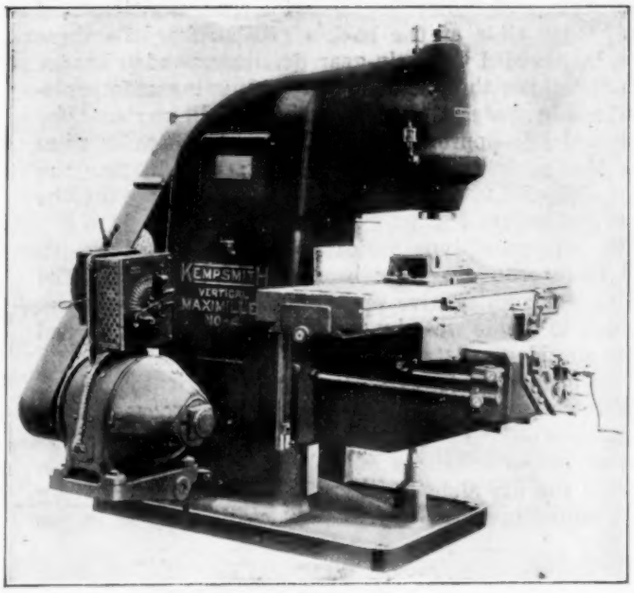


FIG. 1. KEMPSMITH NO. 4 VERTICAL MAXIMILLER (LEFT SIDE)

Likewise, the side walls are solid except for three small openings. The top of the knee has a shallow depression in it to give clearance for the crossfeed screw, located in the center to avoid sidestrain. The knee is counterbalanced by weights located inside of the column. This facilitates the vertical adjustment of the work to the cutter so that a vertical slide for the spindle is unnecessary. The elimination of this slide is claimed to add to the rigidity of the machine. The table has a working face of 70 x 18 in. and a longitudinal feed of 42 inches.

The large-diameter spindle is of alloy steel with the nose hardened, and it runs in adjustable phosphor-bronze bearings. The front end of the spindle is bored to take No. 12 B. & S. taper shanks and the hole extending through the spindle is $1\frac{1}{8}$ in. in diameter. Eighteen spindle speeds are provided, giving a range from 14 to 355 r.p.m. The shafts in the spindle train are large and of heat-treated alloy steel. All shafts in the speed transmission run in ball bearings. Large spiral bevel gears of a coarse pitch are used, giving a smooth, silent drive.

A right-hand spindle drive is used to give the normal direction of rotation for drills and boring tools. A spindle reverse has been incorporated in order to get cutting strains in the proper direction for face mills.

A hand lever at the front of the machine operates a friction plate-type clutch, which has large-diameter friction surfaces forced together by a combination toggle and plain lever movement. The clutch is easily accessible for adjustment for wear. The momentum of the spindle is overcome by a brake operating on the reverse throw of the clutch lever.

The machine is equipped with a rapid power traverse which gives 100 in. per minute travel of the table in either direction, and 36 in. per minute on the vertical and transverse movement. The controls for these movements are so located that it is unnecessary for the operator to change his position in operating any of the rapid traverse or feed movements. Safety devices are incorporated in the mechanism so that no harm will occur should the operator shift the wrong levers. Two levers control the longitudinal feed and rapid traverse, and the operator merely pushes the one required in the direction that he wishes the table to travel. The knee and saddle are controlled by a second set of two levers, and the unit which shall move is determined by push pins located close to the respective hand-feed handles.

Eighteen changes of feed are provided, ranging from $\frac{5}{8}$ to 25 in. per minute in geometrical progression. The gears are heat-treated steel and run constantly in an oil bath. Safety devices are incorporated which will slip before a destructive load comes on the feed drive but will take up their driving function again without attention as soon as the load drops to safe limits. The change in the rapid-power-traverse rate does not affect the speed rate of the cross and vertical movements, these remaining the same for all movements. The rapid traverse is available even when the spindle and feed are not operating.

A centrifugal pump of about 15 gal. per minute capacity is built into the machine for furnishing the coolant and this can be disengaged when the coolant is not required.

The gears and bearings in the entire speed and feed mechanism run constantly in oil and are splash lubricated. The balance of the oiling system is centralized at two points.

The machine is regularly arranged for single-pulley drive, and a $16\frac{3}{4}$ in. in diameter pulley takes a 6-in. belt and runs at 400 r.p.m. The pulley shaft is mounted on ball bearings and with the clutch is inclosed in a protective housing. The machine can be furnished with a direct-belted motor drive, in which case a 15-hp. motor, running at 1,200 r.p.m. is recommended.

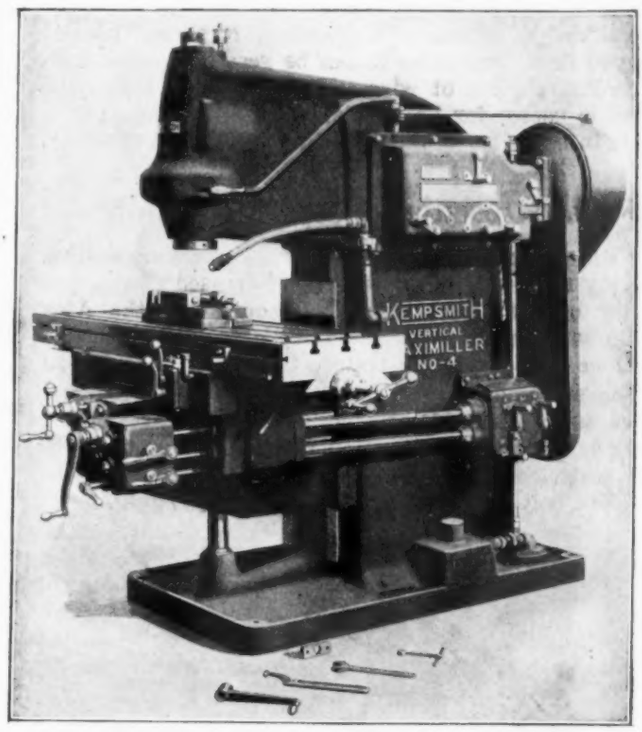
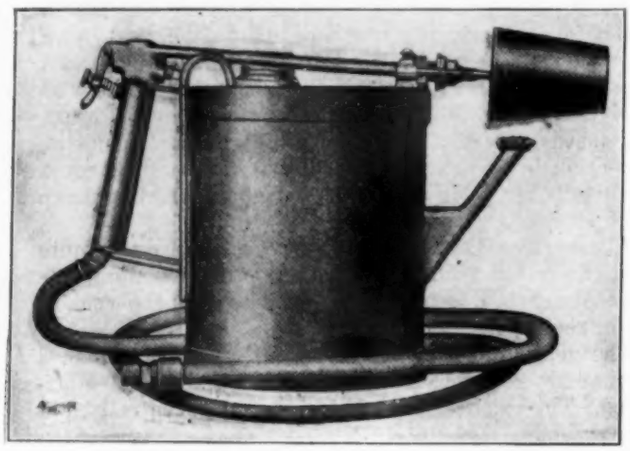


FIG. 2. KEMPSMITH NO. 4 VERTICAL MAXIMILLER (RIGHT SIDE)

Specifications: Table working surface, 70 x 18 in.; longitudinal movement, power, 42 in.; transverse movement, power, 14 in.; vertical movement, power, 20 in.; nose of spindle to table in lowest position, 22 in.; throat distance, 19 in.; spindle taper hole, No. 12 B. & S.; eighteen spindle speeds, ranging from 14 to 355 r.p.m.; eighteen feed changes, from $\frac{5}{8}$ to 25 in. per minute; rapid power traverse, longitudinal 100 in., transverse and vertical 36 in. per minute; driving pulley, $16\frac{3}{4}$ in. in diameter, 6 in. belt, 400 r.p.m.; power required for motor drive, 15 hp. at 1,200 r.p.m.; floor space, 99 x 122 in.; net weight, 11,050 lb.; weight packed for domestic shipment, 11,800 lb.; packed for foreign shipment, weight, 11,975 lb.

The Jiffy Torch

A handy torch, designed for the foundrymen's use in drying the skin of molds, is being marketed by the Mahr Manufacturing Co., Minneapolis, Minn. It is said to light instantly and to project a blue flame of intense heat any distance required from a few inches



THE JIFFY TORCH

to five feet. It burns light fuel oil or kerosene equally well, and operates by means of compressed air supplied by a hose connection. Any available source of compressed air may be used, as the amount of the pressure is immaterial.

The burner works on a principle that prevents the formation of carbon. If, however, it should become clogged from any cause it can be readily cleaned with an ordinary piece of wire. Besides drying molds the torch is useful for brazing and other purposes. It is made in two sizes of one-half and one-gallon capacities.

Ajax Upsetting Forging Machine

With a view to supplying a demand for an upsetting forging machine to withstand the increased strains due to the use of alloy and high-carbon steels, the Ajax Manufacturing Co., Cleveland, Ohio., has developed a machine of the type illustrated.

The machine retains the well-known and tried features such as the sleeve-type, phosphor-bronze, crankshaft bearings in the continuous housings of the bed; the positive die grip, insured and protected by the breaker bolt in the safety knuckle; the lock device

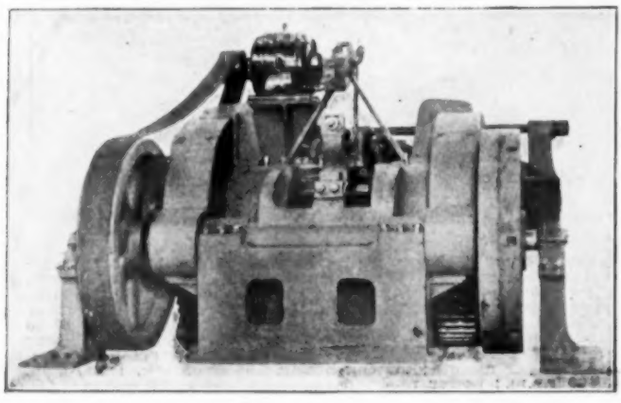


FIG. 1. AJAX UPSETTING FORGING MACHINE

which stops the dies in the wide-open position, and the header slide at the back of its stroke. To these have been added the twin-gear drive, suspended header and die slides, the collapsible self-adjusting safety pitman and a material strengthening of all parts. The new model is approximately 40 per cent heavier than the older model; the 4-in. size weighs 120,000 lb.; the 5-in. size, 155,000 lb., and the other sizes are of the same proportion.

The suspended-type slides are of increased length and operate on overhung bronze-faced bearings. The sliding surfaces receive proper lubrication and are not exposed to undue wear by the accumulation of scale and other abrasive substances.

The header slide carries a triple high toolholder, adjustable to any desired position of the grooves in the gripping dies. The moving die is carried in a box-shaped recess which is supported by the entire side face of the die slide against the backing plate during the heading operation. This prevents local wear in the

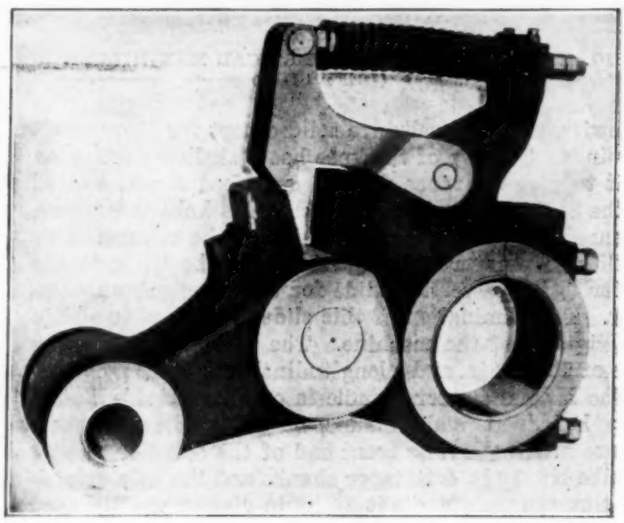


FIG. 2. SELF-ADJUSTING SAFETY PITMAN

backing plate and consequently any rocking tendency of the die slide.

To transmit the power necessary for the making of large forgings, a twin-gear drive from pinion shaft to crankshaft is employed. The driving gear on each end of the crankshaft gives equal torque at both ends of the eccentric pin, greatly decreasing the strain in this part. The crankshaft has been nearly doubled in weight.

The self-adjusting safety pitman is an improvement of considerable importance, in that it fully protects the machine against overloading the heading ram and prevents it from becoming stalled on or near center. The construction of the pitman is shown in Fig. 2, the center pin being slightly above the line of the other two so that a pressure on the ends results in a buckling tendency. This buckling is resisted up to a certain point by the latch held in place by the heavy compression spring. When the predetermined pressure is exceeded the latch jumps up, preventing the building up of additional pressure. On the return stroke the pitman straightens out, the latch drops into place and the machine is ready to continue its work without delay.

The stock gather, die opening and die height have been greatly increased. The two former make possible the production of large forgings in few operations,

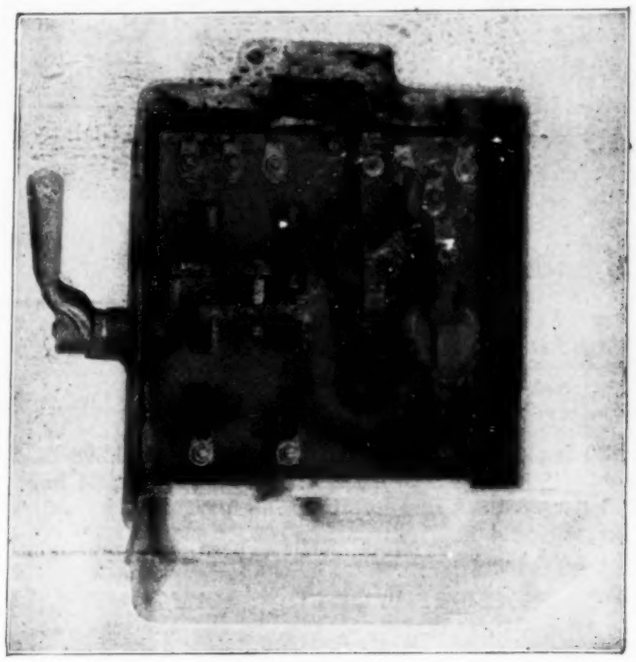
while the latter gives space for the placing of more grooves in a single face of the dies and reduces the number of die changes necessary.

Some idea of the capacity of the machine may be had from a test recently conducted at the plant of this company. A 4-in. machine, in a single blow, forged a disk 9½ in. in diameter and 1¼ in. thick on the end of a 3½-in. bar of 0.60-carbon content, at a cherry-red heat. In doing this the machine gathered 8 in. of stock and flattened it out with no tendency to stalling.

Cutler-Hammer Automatic Starter

An automatic starter of the inclosed type has recently been put on the market by the Cutler-Hammer Manufacturing Co., Milwaukee and New York.

The equipment consists of an automatic motor-starter panel of the counter-electromotive-force type completely inclosed in a cast-iron case with a hinged cover. A magnetic main-line contactor mounted on the panel

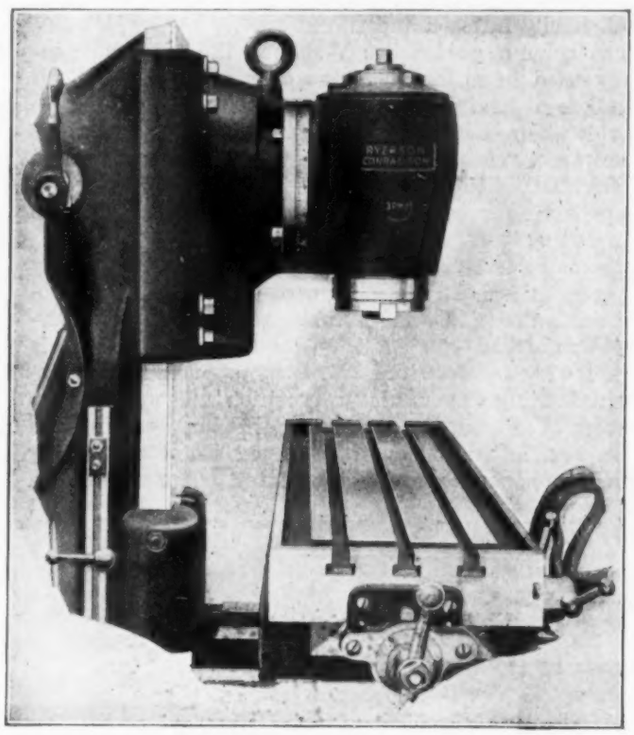


CUTLER-HAMMER AUTOMATIC STARTER

allows remote control from two push-button switches of the momentary contact type. Pressing the "run" button closes the magnetic main-line switch, thereby starting the motor with the armature resistor in circuit. The motor accelerates until it reaches about three-fourths normal speed, when the resistor is automatically cut out of circuit by the closing of the accelerating contactor, the operating coil of which is connected across the motor leads and is energized by the counter electromotive force of the armature. The motor is stopped by pressing the "stop" button or by voltage failure, which causes the main-line contactor to drop out. By using a separate field rheostat, speeds above normal can be obtained if the speed range does not exceed two to one. A common snap switch, a float switch or a pressure regulator can also be used for remote control of the motor. When remote control is not desired the magnetic main-line contactor is omitted, and the motor is controlled by a fused knife switch mounted on the panel with an operating handle outside of the case. The handle can be locked in the open position to prevent unauthorized operation. Interlocks prevent lifting the cover while the switch is closed or throwing the switch with the cover opened. When the knife switch is used, low-voltage release is inherent in the accelerating contactor. Low-voltage protection is provided with three-wire push-button control. The inclosing case is arranged for conduit wiring and can be mounted on a wall or any flat surface. This starter is for use with small direct-current motors not rated over 2 hp. at 115 volts or 3 hp. at 230 volts.

The Ryerson-Conradson Vertical Milling Attachment

The semi-universal type of vertical milling attachment, shown in the illustration, is being built by the Conradson Machine Tool Co. and sold by Jos. T. Ryerson



THE RYERSON-CONRADSON VERTICAL MILLING ATTACHMENT

Made in three types, light (1PM3); medium (2PM3); heavy (3PM3). Speed, 600 r.p.m. Pulley speed, 34-580, 17-290, 8½-145. B. & S. taper, No. 9, 11, 11. Spindle to table: plain milling machine, 13¾, 18, 17 in.; universal machine, 12¼, 16½, 15½ in. Center of spindle to face of column, 11¼, 11½, 14½ in. Weight, 250, 328, 450 lb.

& Son, Chicago, Ill. It is intended for use on the Ryerson-Conradson milling machine and is built in three sizes designated as light, medium and heavy patterns. It is clamped directly to the column dovetail, no dependence being placed on the overarm. The heavy pattern type has a spindle of the same diameter as the main spindle, and, as the taper-hole, faceplate and driving keys are the same die it is claimed that as heavy a cut may be taken with this as with the horizontal spindle.

Columbia Shaper

The shaper illustrated in Figs. 1 and 2 represents an improved design built by the Columbia Machine Tool Co., Hamilton, Ohio. The design employs the same heavy construction as formerly used with the idea of combining rigidity with strength. The machine is built

on the interchangeable basis. As an example of accuracy, the alignment of vise and table with the ram is held to a limit of 0.001 inch.

All elements governing the control are on the working side of the machine. Included in these are the quick-change feed, and the single lever for locking the cross-rail to the column. The quick-change feed adjusts itself automatically to the position of the crossrail, is graduated to show the amount of feed and has a bevel-gear reverse which automatically causes the feed to act on the return stroke. Two levers control all feed changes; one regulates the amount, and the other, the direction of the feed. The changes can be made while the machine is running. A range of feed is provided that is sufficient for all classes of work; eight on the 16- and 20-in. shapers and twelve on the 24- and 28-in. machines. The cross- and down-feed screws are both provided with micrometer adjustment. The feed gears are of hardened steel, totally inclosed and run in oil.

The column guides are V-shaped the same as generally used in milling-machine construction. The column has a straight front but projects at the rear to provide a long bearing for the ram. The straight front permits a maximum back stroke when the head is set in an angular position. A wedge-shaped gib is provided to compensate for wear in the ram bearing. This is adjusted by small screws placed vertically.

The table is fully inclosed on four sides and heavily flanged at the ends. It is supported by an angular projection on the saddle and is easily removable. A revolving table of the type shown on the machine in Fig. 1 is furnished when required. This is supported in a substantial manner upon a large trunnion and has an outer bearing as an additional support. The bull gear is extra large and is carried on a large two-diameter bearing which supports it close to the center. The rocker-arm

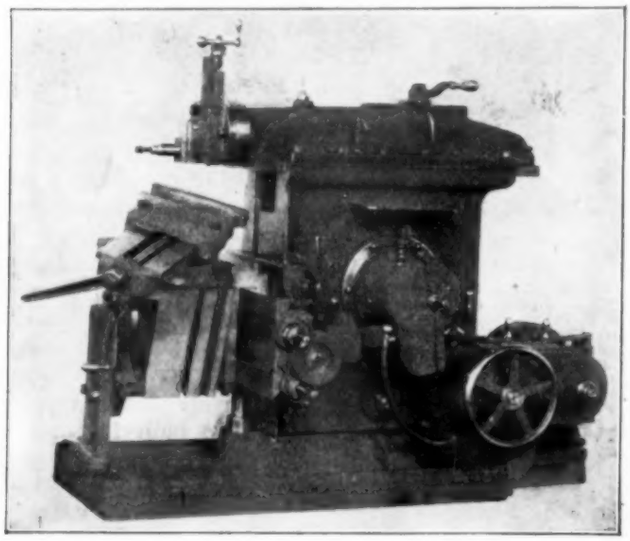


FIG. 1. COLUMBIA 16-IN. SHAPER

is heavily built and is supported at the lower end by a large shaft having self-oiling bushed bearings.

The machine is powerfully back geared, which in connection with the four-change speed box affords eight changes of speed. The speeds are arranged in geometrical progression and have been carefully calculated to afford the proper range and increments. The illustrations show the method of equipping the machine with speed box, friction clutch and brake, adapting it for either single-pulley or constant-speed motor drive. The speed box provides four changes of speed or eight in connection with the back gears. The friction clutch and brake enable the machine to be quickly started or stopped at any point of a stroke.

Net weight: 16 in., 3,000 lb.; 20 in., 4,000 lb.; 24 in., 5,000 lb.; 28 in., 6,000 lb. Crated weight: 16 in., 3,500

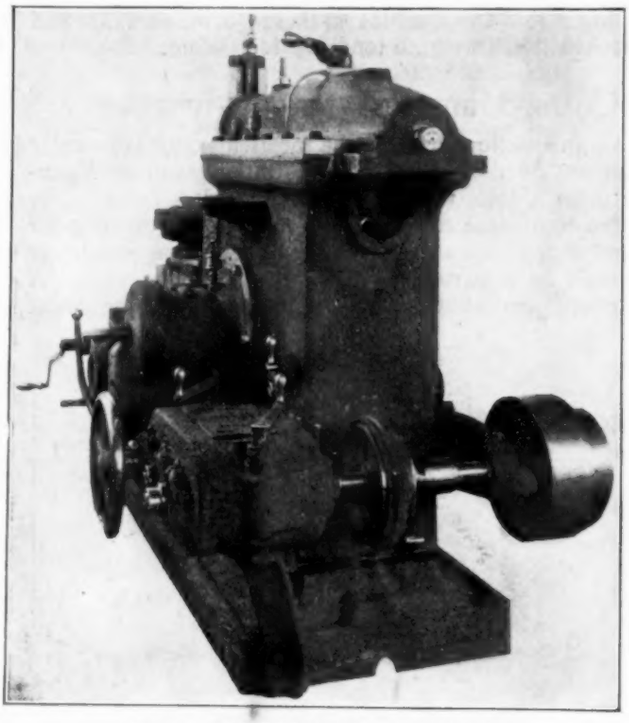


FIG. 2. COLUMBIA 20-IN. SHAPER

lb.; 20 in., 4,100 lb.; 24 in., 5,200 lb.; 28 in., 6,200 lb. Boxed weight: 16 in., 3,500 lb.; 20 in., 4,600 lb; 24 in., 5,800 lb.; 28 in., 7,000 lb. Cu.ft. (boxed): 16 in., 80; 20 in., 100; 24 in., 132; 28 in., 162.

Longer Working Hours

By H. L. Beau

As to the working-hour question of trade unions today, I should say that it would be far better for most people to work 10 or 12 hours a day than to work 6 or 8 hours as some radicals would have it. My past experience with men is that 90 per cent of them are constantly asking for overtime and many of them are anxious to work on Sunday, so I say a longer working day would stop this needless wasting of their money in hours of idleness. There would also be greater production and the sooner high prices would fall. Wages surely are good in almost every line, so let us all economize and all our troubles will soon come to an end.

Women in Industry.—The advent of the gentler sex in industry, so strongly emphasized during the war by the influx of women to the munitions factories, is still further accentuated by the casual manner in which their services are sought through the advertising columns. One local daily newspaper recently carried the following advertisement:

WANTED: BOY—Young lady wanted as office boy in downtown bank. Apply, etc.—From *Literary Digest.*

Business Conditions in England

BY OUR LONDON CORRESPONDENT

LONDON, Feb. 13, 1920.

WHILE an improvement might certainly be made, output generally is, at the worst, moderate. Coal-mining figures are more promising. There are, however, many undercurrents in the sea of labor and, again, the difficulties in the acceptance of orders, due to exchange troubles, are obvious

Estimates of the national finance position are more optimistic than until recently seemed likely. It looks as though the government expenditure will be markedly less and government revenue more than had been estimated; but it is necessary to wait a few weeks before expressing the differences in figures. Values of British exports grow too, and, as shown by monthly returns, have risen by more than 50 per cent since last September. Unfortunately, from the balance of trade point of view, import values are also steadily growing. The value of British manufactures exported in January last was £83,086,250, or more than twice the value for January, 1919. Manufactured articles imported were valued at £31,528,390 last month.

The molders' strike having ended, production in the ordinary engineering and machine shops is steadily improving as castings become available. This is almost the first strike that has been fought out since the opening of the late war, compromises having been the rule. Of course, during the whole period of the strike certain of the foundries were in operation and, after all, the strike was confined to England; that is, it was not extended into Scotland. Still, all shop schemes had to be modified and quite a considerable proportion of the works were closed. No true estimate can be made of the cost, but the workpeople returned on terms which they would certainly have obtained if there had been no strike; that is, with an increase of 5s. a week, an increase which was awarded to engineering workpeople generally as the result of the periodical enquiry. It is quite probable that on both sides a mistaken estimate was made. The workpeople apparently thought that a stoppage by the three unions concerned would very quickly end engineering production generally. On the other hand, the employers, who certainly had right on their side, quite conceivably estimated that complete drainage of the funds of the unions concerned would automatically end the strike, forgetful of the fact that loans can be obtained from other unions—indeed easily in view of the idea of solidarity among organized workpeople.

Meanwhile, many British workpeople seem to be set against the idea of payment by results. Representatives of the federation of engineering employers and of the engineering trade unions met recently to discuss the economic future of their industry, and particularly to improve conditions of employment. So far as is known (no official report was issued), after the better part of a week's discussion the members of the conference separated without arranging for a future meeting, being unable to agree on the said question of payment by results. The position is at the moment of writing thought to be somewhat ominous. The engineering unions are to ballot on the question. Objection to the premium-bonus system is marked, and many workers are demanding recompense at so much an hour for attendance, without any guarantee as to what will be done in the time. The result shows in all sorts of ways; in the Midlands, for example, it is leading in some measure to brass casting leaving Birmingham for neighboring towns, where at present a larger output per person employed can be obtained.

That production is necessary has been brought home to certain workers pretty sharply during the last few days. In North London a factory is run by Brinsmead & Sons, a firm of pianoforte makers whose name is known all over England, the concern having been in existence something like 100 years. Now a few days ago the management gave notice that the works would close in a week's time. (They are to be opened shortly for a "probationary" period.) The reason cannot be more succinctly given than in the statement issued to the effect that "*for each piano dispatched per week there are now twenty-six employees, against twelve in 1918, and six immediately before the war. The factory wages alone per piano exceed the selling price. The cost of polishing only is approximately equal to the pre-war prime cost of the completed piano, including materials.*" *There was no quarrel with the workmen, merely inadequate production.* The case must be particularly bad as the pianoforte industry was one of the first in Great Britain to seize the opportunity to raise prices and indeed to supply inferior articles as soon as importation from abroad was stopped. The workpeople, as soon as they got their wind after the blow, blamed the new management. It is only fair to state that a number of other pianoforte manufacturers have issued a joint statement to the effect that the conditions mentioned are not general.

As is stated above, the reply of the Brinsmead workpeople was simply to blame the new management. This draws attention to a defect in the Whitley schemes for dealing with industries as a whole, which was pointed out some months ago in the European edition of this journal and is now being emphasized in other directions. While employer and employed under these schemes can meet in joint conference, there is no special place for technical and commercial men engaged in the conduct of business. Thus, while capital and labor (manual) may fairly be said to be represented, the share of mental effort in industry is not separately recognized. The general position is leading to the formation of trade unions among brain workers and private conferences are being held for representatives of branches of medicine, the law, engineering, etc. There is, in fact, a Society of Technical Engineers; one of its objects appears to be to press for the inclusion of a third body in the Whitley schemes. Other organizations are the National Union of Scientific Workers, the Association of Engineering and Shipbuilding Draftsmen, the National Association of Supervising Electricians, the Electrical Power Engineers' Association, etc. It is proposed to form a National Federation of Professional, Technical and Supervisory Workers. The same movement can be seen in France.

It is gradually becoming apparent that the continuous efforts to increase wages are really short-sighted, and that the endeavor should rather be to decrease prices of commodities. Yet some sympathy must be felt for those who take the more obvious way to meet at the moment the continually increasing cost of living.

Since the war the rise has been between 130 and 140 per cent, and it has not yet ceased, despite the promises of politicians. American readers should note that rent as a rule cannot be included in this estimate as, excepting in the case of houses quite outside the means of ordinary working people, rents are by law fixed at those which obtained at the outbreak of war. Further, bread which is sold at 9½d. really costs about 15d., the difference being made up by subsidy. Before the war 5d. or 6d. was the price. Workpeople know that large profits are in many instances being claimed and made. They know that rings and combines abound for the maintenance and increase of prices. They perceive that the so-called Profiteering Act is almost an absolute failure. They study the papers and note the dividends declared, as for instance in the cotton industry and in shipping, and they read extracts from reports of official inquiries into the wool industry and others. In plain fact, between high prices, high taxation and rising local rates, many people on fixed salaries, who before the war were comfortably placed, are now worse off than manual laborers. Very seldom have the employing classes voluntarily raised salaries in proportion to needs; "black coat" unions are the result.

The fact that rises in wages, if sufficiently continued, must imply increased prices has been recognized by certain branches of transport workers, for the union of railway-

men concerned are understood to be supporting the directors of the underground transit system of London in their demand for a doubling of pre-war fares. It is also understood that the parliamentary bill which will enable this to be done abolishes simultaneously workmen's fares. Of course, if by their action the railwaymen imply that workers should have no special privileges their action may be supported.

Meanwhile, the demand for machine tools is much in excess of supply. Labor, material and transport charges are growing. There is every prospect at the moment therefore of increases in prices; in some cases they have been announced. Indeed, if the expected increase in castings prices is made the percentage rise of prices for complete machine tools will, in some instances, be half the percentage increase in the cost of castings. The call on Sheffield for steels of all kinds is in many cases outside production capacity and both here and as regards machine tools in particular, the Far East has sent many inquiries and orders, India, China and Japan being specially mentioned. As to the European continent, trading is badly handicapped by the condition of the exchanges.

The tendency to amalgamation of interests is shown in the suggestion that Fletcher, Russell & Co., Ltd., Warrington, furnace maker, should join a furnace makers' combination called Radiation, Ltd. This combine was formed a short time ago by the J. Wright and Eagle Range, the Richmond Gas Stove and Meter Co., and the Davis Gas Stove Co. concerns.

Some Recent Machine-Shop Introductions in Great Britain

Among more recent introductions for the machine shop in Great Britain are cutting tools having shanks of mild or other steel with tips of high-speed steel, in a sense, cast electrically, not simply welded on. For this purpose the end of the shank is ground and around it is built-up a mold, carbon plates being clamped so as to form this. By means of suitable electrodes the metal is then deposited electrically. The contents of the electrode core can, of course, be arranged to suit requirements, but in this instance they are in the form of a mechanical mixture, not an alloy. In the course of a visit by a representative of this journal to the works of Alloy Welding Processes, Ltd., at Church St., Islington, London, N., the tools actually being produced at the time contained 5 per cent each of tungsten and molybdenum, 4 per cent chromium and 1 per cent vanadium. This is one of the standard mixtures of the firm. There are others and E. H. Jones, who is responsible for the process, is in fact carrying out a small research with a view to the production of special steels for cutting. The tool is used in the ordinary way until the high-speed-steel tip is ground off. A fresh deposit can then be made, but high-speed steel cannot be deposited on an existing high-speed-steel tip. This is of course but one of the applications of the electrodes manufactured by the firm named. They both supply tools and instruct their customers to make them, and a small school has been arranged for this purpose. But no manual skill is required; this work indeed is among the first undertaken by lads who are being trained as electric welders.

During the war the British Board of Trade organized a series of trade exhibitions, and these are being continued. For the current year they are being held simultaneously from Feb. 24 to March 5 in London, Glasgow and Birmingham, instead of, as formerly, in London only. Each exhibition has been arranged to have its own character according to the district. The exhibition for Birmingham is being held at a little distance outside the city; namely, at Castle Bromwich, where kiosks have been added to the aërodrome buildings in order to find exhibition space for some quantity of hardware, including smaller machine tools and engineers' and other hand tools; motor-cycles, cycles, motor-car accessories; ropes; lighting fittings of all kinds; cooking stoves, etc. At Glasgow the exhibits include chemical products, boots, clothing, textiles, etc. The London branch of the British Industries Fair, as it is officially known, is at the Crystal Palace, Sydenham, S.E., where lighter and fancy goods, such as jewelry, glassware, leather goods, toys, scientific instruments, etc., may be noted.

Reports received from Glasgow confirm those of practically every other district, to the effect that iron and steel of all kinds are in greater request than production facilities. Foundry qualities of pig iron are in special call and in Glasgow the price of No. 1 iron for export is £12 10s. a ton. It is also mentioned that Scottish makers of steel plates have again advanced prices by £1 a ton. While mentioning Glasgow, reference may be made to the shipbuilding industry there. Launches in January on the Clyde totaled nearly 40,000 tons, said to be a record for this particular month, when output is generally affected by the New Year holidays. A Glasgow correspondent mentions particularly that geared turbines appear now to be displacing reciprocating engines for cargo boats.

American readers will be sorry to note the death of Arthur Wilzin of the E. W. Bliss Co. (Paris) at Nice on Jan. 2 in his fifty-ninth year. The columns of this journal have more than once borne witness to his ability in press work, etc. His ingenuity showed itself in connection with hydro-mechanical presses, automatic body-flanging presses, automatic glass-gathering and blowing machines, etc. His flatware manufacture process was the subject of a long article in the *American Machinist* for Sept. 2, 1915.

Machine Tools Wanted by the French Commission

We announced some time ago the closing of a contract between the War Department and the French Government for surplus machine tools to the value of $25,000,000. At that time it was stated that a French commission would come to this country to select the tools and arrange for their shipment and delivery in France.

For the information of machine-tool builders and dealers we are printing the first list of the French requirements which has just reached us. It should be understood that this list shows the maximum program. The members of the commission are probably fully aware of the difficulties likely to be encountered in getting all they want from our surplus stock, particularly in view of the serious inroads made on it by the Belgian commission and by the beneficiaries under the Caldwell bill. Just what is to be done to fill the gaps has not yet been announced. If further information is desired it may be obtained from the Director of Sales, War Department, Washington, D. C.

The list follows:

MAXIMUM PROGRAM OF PURCHASES BY THE FRENCH COMMISSION

Specification Grinding Machines	Maximum Number	Manufacturers (in preferential order)
Universal Tool and Cutter Grinders	350	Brown & Sharpe Cincinnati Leblond Greenfield
Twist-Drill Grinders	300	Lassalle Wilmarth & Morman
Cutter Grinders	50	Pratt & Whitney
Tool Grinders	350	Gisholt Sellers
Saw Sharpeners	75	
Knife Grinders	50	
Surface Grinders (w. t)	50	Reed & Prentice Diamond Pearsons-Arter
(disk)	80	Heald
(plain)	120	Brown & Sharpe Abrasive
Internal grinders	50	Heald
Plain grinders, 12-16 in. x 36 in.	100	Brown & Sharpe
x 48 in.	150	Landis
x 60 in.	100	Norton
x 72 in.	60	Cincinnati
x 96 in.	60	Bath
x 120 in.	30	Queen City Modern Tool
Universal Grinders	300	Brown & Sharpe Landis Norton

Horizontal Boring, Milling and Drilling Machines		Maximum Number	Manufacturers (in preferential order
Diam. of spindle	2 in. to 3 in.	400	Lucas
	3 in. to 4 in.	500	Beaman & Smith
	4 in. to 6 in.	500	Universal
	above 6 in.	200	
Milling Machines			
Hand		150	Pratt & Whitney Fox, etc.
Duplex		30	Pratt & Whitney Hendey
Lincoln type		80	Ditto
Briggs type		40	Gooley & Edlund
Profiling		30	Pratt & Whitney Leland & Gifford
Thread Milling		150	Pratt & Whitney
Slab Millers		100	Ingersoll Beaman & Smith, etc.
Plain Horizontal	1	150	Brown & Sharpe
	2	250	Milwaukee
	3	300	Cincinnati
	4	150	Cleveland Leblond
Universal	1	250	Kempsmith
	2	400	Becker (vertical)
	3	450	Van Norman
	4	180	Hendey Osterlein
Vertical	1	40	Becker (horizontal)
	2	150	Garvin
	3	200	Fox, etc.
	4	120	
Centering Machines			
		300	Pratt & Whitney Hendey Whiton
Saws, Machine			
Alternative (Hack)	18 in.	200	Espen-Lucas Atkins Racine, etc.
Circular	18 in.	50	Cochrane-Bly
	20 in.	75	Nutter-Barnes
	24 in.	50	Espen-Lucas
Band		20	
Friction	16 in.	60	Ryerson
	24 in.	60	
	32 in.	30	
Vertical Boring Mills			
	24 in.	70	Bullard Niles-Bement-Pond
	36 in.	100	Cincinnati Gisholt
	42 in.	130	Rogers
	48 in. and more	150	
Lathes			
Engine (toolmakers)		500	Lodge & Shipley Pratt & Whitney Hendey Springfield
Engine (standard)	14 in. x 6 ft.	200	
	x 8 ft.	270	Lodge & Shipley
	x 10 ft.	200	Pratt & Whitney Hendey
	16 in. x 6 ft.		Reed & Prentice
	x 8 ft.	250	Prentice
	x 10 ft.	340	Leblond
	x 12 ft.	250	American Tool Greaves-Klusman
	18 in. x 8 ft.	250	Cincinnati
	x 10 ft.	400	Bridgeford
	x 12 ft.	370	Boye & Emmes Advance
	20 in. x 8 ft.	270	Whitcomb & Blaisdell
	x 10 ft.	300	Cisco
	x 12 ft.	375	Rahn Larmon
	x 14 ft.	300	Monarch Davis
	22 in. x 10 ft.	250	Simplex
	x 12 ft.	320	Rockford
	x 14 ft.	400	Sebastian
	x 16 ft.	320	South Bend Sydney, etc.
	24 in. x 12 ft.	300	
	x 16 ft.	500	
	x 20 ft.	470	
	x 24 ft.	380	
	more	100	
	27 in. x 12 ft.	250	
	x 16 ft.	400	
	x 20 ft.	350	
	x 24 ft.	300	
	more	75	
	More than 27 in.	450	
Bench (precision)		150	Rivett Pratt & Whitney
Bench (standard)		100	
Axle		100	
Automatic (tread)		75	
Screw Machines (hand)		300	Brown & Sharpe Warner & Swasey
Screw Machines (automatic)		150	Gisholt Acme automatic Gridley Cleveland
Gear-Cutting Machines			
Straights		190	Brown & Sharpe Gould & Eberhardt
Bevels		130	Gleason
Herringbone		15	
Rack		40	Walcott

Hammers	Maximum Number	Manufacturers (in preferential order
Steam		
Drop	50	
Belt	20	
Pneumatic	300	Nazel
Spring	25	Beaudry Fairbanks
Bradley	80	Bradley
Presses		
Bulldozers	220	Ajax National Acme
Punching	60	Bliss Billings & Spencer
Drawing (weight under 5 ton)	50	Toledo
(5 to 10 ton)	25	Consolidated American Can Co.
Shears		
Sheet (under ¼ in.)	180	
(¼ to ½ in.)	80	
Plate	20	
Punching shear (single)	60	
(double)	40	
Universal	100	
Drilling Machines		
Radials (belt)	100	
(standard or universal), 2½ ft.	140	Cincinnati
3 ft.	280	American Tool
4 ft.	280	Prentice
5 ft.	200	Fosdick
above	50	Morris Muller Carlton
Heavy Duty	400	Colburn Baker
Standard Upright 16 in.	175	Cincinnati
20 in.	260	Reed & Prentice
22 in.	350	Aurora
24 in.	350	Milwaukee
26 in.	225	Barnes
28 in.	175	Rockford
30 in.	100	Snyder
36 in. and above	150	Sibley Silver, etc.
Post & Column	400	
Bench	100	
Rapid Sensitive 1 spindle	150	Henry & Wright
2 spindles	80	Allen
more than 2	45	Avey Taylor & Fenn Leland Gifford Barnes
Planers 24 in. x 24 in. x 8 ft.	100	Cincinnati
30 in. x 30 in. x 10 ft.	175	Woodward & Powell
36 in. x 36 in. x 12 ft.	250	Whitcomb
48 in. x 48 in. x 12 ft.	200	Gray
above	75	Powell Wilson Niles-Bement-Pond, etc.
Slotters		
Stroke 4 to 10 in.	425	Pratt & Whitney Dill Tool
10 to 14 in.	300	Niles-Bement-Pond Newton
above 14 in.	150	
Shapers		
Stroke 14 in.		Gould & Eberhardt
16 in.	180	Potter & Johnson
20 in.	300	Cincinnati
22 in.	320	Hendey
24 in.	360	Milwaukee
28 in.	400	Queen City
30 in.	240	Smith & Mills
32 in.	100	Steptoe, etc.
2-head	100	

Setting the Milling Machine in Alignment

BY J. W. CUNAU

On page 356 of *American Machinist* John A. Grill shows a method of aligning a milling-machine vise with the travel of the saddle by using a micrometer clamped on the cutter arbor to register against a parallel clamped in the vise.

My method is identical except that I use a dial indicator instead of a micrometer, and I claim that time is saved by reason of the fact that in the preliminary settings only a very short movement of the saddle is necessary to indicate the direction and amount that the vise must be moved.

The button of the indicator being at all times against the parallel, the position and movement of the latter is always under observation.

Sparks from the World's

By E. C. Porter.

Military Engineers' Society Is Being Organized

A national association of present and former officers of engineers and civil engineers who have served in any army or branch of the U. S. Army—Engineers, Ordnance, Signal Corps, Infantry, Cavalry, Artillery, etc.—to be called the Society of American Military Engineers, is being organized by a committee in Washington appointed by the Chief of Engineers. The society's objects are to promote the science of military engineering and to foster the cooperation of all arms and branches of the service, and of civilian engineers in that science. The objects and a provisional constitution of the Society have been approved by the Chief of Staff.

A board of engineers was appointed Nov. 1, 1919, by the Chief of Engineers to consider and report on the feasibility of a technical organization of officers and civilian engineers experienced or interested in military engineering. At the same time the Chief of Engineers required a letter-ballot for or against such an organization from all officers of the Corps of Engineers and temporary engineer officers then in the service. The vote was overwhelmingly in favor of the proposed society.

The board then resolved itself into a committee on organization. Its members are: Colonels F. V. Abbott, Charles Keller, and G. A. Youngberg; Majors George P. Pillsbury, George R. Spalding, P. F. Bond, Max C. Tyler, John C. Kingman and David McCoach, and Captain Douglas L. Weart.

Following a canvass of representative opinions which showed reserve officers and others who had been in the engineering service during the war to be strongly favorable to such an organization, the committee drafted a provisional constitution and created a temporary board of directors from its membership. This constitution is already being submitted for approval or comment to individuals who are known to be interested in the organization and eligible to membership; its more important features follow:

The annually elective officers are to be a president and first and second vice presidents. The president is to be an officer of the Corps of Engineers on the active list. There is to be a secretary, an editor and a treasurer chosen by an executive committee, the first two from the regular army. A board of directors, to have eighteen members, is to be elected by the three divisions of active membership, as follows: Six by the regular army, six by the National Guard and reserve forces, and six from the membership exclusive of the foregoing two groups. There is to be an executive committee consisting of the president, the two vice presidents and not to exceed three others to be elected annually by the board of directors from its own members. Other standing committees are: Rules and ethics; auditing, finance, membership, nominations and necrology; service relations and military policies.

The annual meeting is to be held in Washington, and its date is fixed with reference to that of the American Society of Civil Engineers in order to make possible attendance of members at both meetings. The dues are fixed not to exceed $5 per year, those for the present year being $4.50.

The Society is to publish bi-monthly a journal to be called "The Military Engineer," which will supplant "Professional Memoirs" heretofore published by the Corps of Engineers.

Further information regarding the society may be secured from Col. G. A. Youngberg, Office, Chief of Engineers, U. S. Army, Washington, D. C.

Manufacturer Forms Export Company

The Walworth International Co., a subsidiary recently formed by the Walworth Manufacturing Co., Boston, to handle the export trade, is located temporarily at 39 Broadway, New York. The new company will also represent nine associated companies in the export markets, taking over the established foreign offices of the Walworth Manufacturing Co. in London, Paris, Johannesburg, Sidney, Bremen, Buenos Aires, Havana and Santiago. Officers of the international company are: W. Ayer, president, and Alfred J. Eichler, vice president and general manager. The New York sales manager is Charles Keefe and engineer J. L. Barry.

Reorganized Newark Company

A reorganization of the Slocum, Avram & Slocum Laboratories, Inc., took place Jan. 1, 1920, and has resulted in a complete change in the management of the company.

This company has recently taken over the manufacture of all "Flexite" products heretofore produced by F. R. Blair & Co., Inc., including universal joints, propeller shafts, and flexible magnetic couplings.

Their manufacturing plant is located in Newark, N. J., and the executive offices in the Woolworth Building.

Special Libraries Association Is Taking a Census

At a time when the Government is counting up its inhabitants, the Special Libraries Association is enumerating the special library collections of the country, because there does not exist at present an adequate directory of special libraries.

During the World War, when army camps and military centers were furnished with libraries for research and educational work, the men detailed to look up information for the Government were hampered by the lack of a satisfactory list of information centers which they might call upon for emergency assistance. Time and again army men could have used a directory of institutions or corporations having special information which they would permit them to consult, had such a publication been in existence.

In the spirit of co-operation, and in order to list the special information sources of the country, the Special Library Association—the national body of special librarians—submits the following questions and respectfully asks you to take the trouble to answer them. When compiled, the directory will not be used as a mailing list for advertisers, but merely for the purpose stated, namely, to have in a central place, a record of the Special Information sources of the country.

A special library has been defined as: "A good working collection of information either upon a specific subject or field of activity; it may consist of general or even limited material serving the interests of a special clientele; and preferably in charge of a specialist trained in the use and application of the particular material."

If your library comes within the above qualifications the Special Library Association will appreciate the following information from you: (1) Name of institution or company; (2) name by which library is known; (3) name of librarian or custodian; (4) can it be classified as any of the following: Financial, business, legal, engineering or technical, institutional, municipal, reference, agricultural; (5) if not, how can it be classified? (6) does it serve a special clientele? (7) would your librarian be willing to assist other special libraries to a reasonable extent?

The above data should be sent to Wm. F. Jacob, chairman library census committee, care of General Electric Co., Schenectady, N. Y., who will be grad to answer any questions relating thereto.

Industrial Forge

News Editor

Disposal of Surplus Machine Tools of the War Department Proceeding Rapidly

Educational institutions in various parts of the country which have taken advantage of the provisions of the Caldwell Act, allowing technical schools and colleges to purchase surplus machine tools of the War Department at 15 per cent of cost, have commented favorably upon the equipment and the service rendered by the machine-tool section of the Office of Director of Sales.

J. M. Bowlby, in charge of the educational features of the machine-tool section, said that up to the end of February, 944 schools had made inquiry regarding the details of the Caldwell law, 310 questionnaires had been returned and 5,141 coupons had been issued with which schools could make application for tools and equipment at the various district offices and supply depots.

Approximately $350,000 worth of machine tools have already been selected by the French Commission, which has contracted to purchase from the War Department about $25,000,000 worth of machine tools and equipment.

Emergency Fleet Corporation To Dispose of Vast Amount of Machinery

The sales section of the Emergency Fleet Corporation has about completed a comprehensive inventory of approximately $350,000,000 worth of machinery, shop equipment and raw materials of various kinds which will be offered for sale to domestic manufacturers and consumers.

The means for disposing of this vast amount of surplus property, which was purchased during the war to carry out the Government's shipbuilding program, is rapidly being perfected. The head offices of the section were recently removed from Philadelphia to Washington. District sales organizations have been set up in principal centers throughout the country as follows: New York, Boston, Chicago, Philadelphia, New Orleans, San Francisco, Portland and Seattle.

It is the plan of officials in charge of the disposal of the surplus property of the Emergency Fleet Corporation to sell the material as quickly as possible so that warehouses, storage yards, shipyards and plants may be made available for more productive purposes. Manufacturers will find in the surplus materials of the Emergency Fleet Corporation, officials of the sales section point out, many items for which they are now paying high prices and commodities which are almost impossible to secure under present manufacturing conditions.

While these materials were purchased for shipbuilding purposes, it is claimed that unlimited quantities of the surplus property will be found available for other manufacturing purposes.

Approximately $35,000,000 worth of such materials has already been sold since the organization of the sales section last May. The sales program, however, until now has not been very intensive.

With the completion of the inventories and appraisals of the surplus commodities, the Emergency Fleet Corporation will launch an active sales campaign.

It is the plan of the sales section to issue from time to time bulletins and catalogs informing the trade as to details regarding the description and quantities of the materials to be sold.

Demand for Commercial Credit Still Growing

"Reductions in the volume of funds employed in stock-market operations seem to have been more than offset by increased requirements from commercial and industrial sources," the National Bank of Commerce in New York declares in a discussion of the money market in the March issue of its magazine, *Commerce Monthly*. "Because of this pressure for additional supplies of commercial credit, there has as yet been no realization of the strain under which the country's banking system has been laboring."

"It is probable, moreover," the bank says, "that although increasing care is being exercised by users of credit in making forward commitments, the demand for funds for commercial purposes has not yet passed its maximum. There is, therefore, no prospect of an easing of commercial money rates in the early future."

"Further increases in the outstanding volume of credit in this country should be avoided, particularly in view of the steady outflow of gold," the bank advises, and adds:

"Any easing of money-market conditions must come from a decrease in credit requirements and not from an increase of the aggregate volume of credit. In this situation it is highly desirable that banks and business interests generally co-operate to conserve credit for essential employments and to minimize its use in non-productive activities."

General Electric Co. Establishes a Training School for Employees

Recognizing the growing demand for trained business administrators, the General Electric Co., Schenectady, N. Y., has announced a new departure in its educational system by the establishment of a business training course for college graduates without technical education. This course in business administration is also being extended to include the graduates of technical colleges employed in the company's testing department, with the idea of giving the prospective engineer a broad business background for his future work. Students taking this course will be paid by the company according to an established scale.

In many respects the new plan resembles the training schools established by such institutions as the Guaranty Trust Co., National City Bank and the Standard Oil Co., and will be conducted along similar lines, with one or two important exceptions.

The General Electric Co. now employs in its technical departments from 400 to 500 college graduates every year. Students from twenty foreign countries are represented in this enrollment.

The International General Electric Co., Inc., a separate corporation recently formed to handle the foreign business of the parent concern, is planning to establish a similar course of training for students who will represent it in the foreign field in various capacities. A course in foreign exchange will be one of the features of the curriculum.

Cotton Machinery Company Erecting New Buildings

The Saco-Lowell Shops, manufacturer of cotton machinery, etc., with offices at 77 Franklin St., Boston, Mass., is carrying on some extensive additions to its various plants. It has recently completed a one-story 160 x 200-ft. plant addition to its factory in Newton Upper Falls, Mass. Contracts for a two-story, 194 x 300-ft. reinforced-concrete foundry building at the same plant has just been awarded. This company is also building a five-story, 87 x 310-ft. concrete fireproof storehouse at the Biddeford, Me., plant. Plans are also being prepared for a two-story, reinforced-concrete and steel machine shop at the Lowell, Mass., plant. Altogether the outlay for the new buildings being erected by the company will total close to one and one-half million when completed.

Introduces Bill To Establish Standard and Decimal Divisions of Weights, Measures, Etc.

Senator King of Utah has introduced, by request, a bill to establish standard and decimal divisions of the weights, measures and coins. The bill has been referred to the Senate committee on standards, weights and measures, and it is not thought likely it will be given any consideration at the present session of Congress, if at all. Senator Reed, chairman of that committee, as has been stated in these columns previously, is opposed to all bills providing for a change in the standards of measurement from the existing English system.

The bill introduced by Senator King provides for a wholly different standard than that proposed by proponents of the metric system. It would establish the decimal system and retain the present foot, ounce, bushel and ton. A foot would be divided decimally into 10 decimal inches, 100 lines and 1,000 points. The square of a decimal inch would be called a decimal square, and the decimal cube would be transferred into a unit of weight by making a decimal cube of water at maximum density an ounce.

Proceeding from this basis 1,000 points would equal one foot, 1,000 grains one ounce, and 1,000 ounces one weight unit. The point is for fine mechanical and scientific measures, and the grain is for fine weights and the ounce is for retail trade weights. The intention is that retail trades be carried in ounces rather than in pounds and that 32 of these weight units for gross weights would equal the present ton of 2,000 pounds.

The two changes that would take place, if the bill were passed, would be the adoption of the point for fine mechanical measure instead of fractions of the inch and millimeters, the point being much finer than the millimeter, and the present ounce would become the unit for retail trades.

The primary units of the decimal system are the foot and the ounce. The ounce is derived from the foot by being the weight of the cube of the tenth of the foot of water at maximum density. The decimal notation is only of advantage, it is pointed out, when dealing with fractions or divisions of the units. It is of no utility in dealing with multiples of the unit. The decimal system, its proponents contend, affords all of the advantages of the decimal notation, held by them to be the only merit of the metric system, and likewise preserves the convenience, facility and utility which is inseparable from the customary measures of length and weight of this country.

The old common measures, including the common inch, are recognized and are not abrogated by the bill and their obsolescence, it is maintained, should be progressive except as retained in the technology of certain trades. The design, advocates of the bill say, is to improve and develop our present system and bring it into decimal co-ordination. It is not designed, they state, to interfere with the customs of trade or mechanics but to point the way to an improved relation of fine mechanical measures to the standard foot.

Those urging the change explain that Washington recommended a uniform system of weights and measures for use by the colonies in his first message to Congress and that Jefferson, while Secretary of State in 1790, made an elaborate report containing a project for the decimal system of weights and measures based upon the decimal division of the foot into inches, lines and pounds. The present bill, it is stated, agrees substantially with Jefferson's plans. It also is pointed out that James Watt, one of the first to propose a decimal system of weights and measures for Great Britain, preferred a system which would retain the present foot and ounce, and did not advocate a metric system, it is declared, as advocates of the latter have claimed in propaganda they have issued.

Man Axioms

W. S. Rogers, a very successful manufacturer, has quite different ideas from the "efficiency engineers," et al. His practical observations are dynamic. Here are but a sample of them:

I hold that the developing of men is the big thing in business.

I do not want the man who is a static machine but rather the fellow who is on the way to the top.

Workmen are individuals and cannot be treated in mass.

I hold not only that you cannot standardize a man, but that it would not be desirable to do so if you could.

Efficiency figures are not truthful records unless they take into dollars-and-cents account the cost of hiring and firing.

We do not want recommendations or references, because we are buying present and future services and not history or family record.

I hold it to be criminal to take a boy, assign him to one task and keep him at it; that is robbing the boy of all that he has—his future.—*Brass World.*

New Consulting Engineering Organization

J. C. Henriques and M. A. Stone, Jr., have organized a staff of consulting engineers, and formed the Engineering and Appraisal Co., Inc., with offices at 103 Park Ave., New York, opposite Grand Central station.

Their field of work will cover the design and construction of mills, factories, power plants and chemical works, the design and development of special machinery and the formulation of commercial propositions on which the formation of new manufacturing corporations may be based.

The Life of the National Screw Thread Commission Recommended To Be Extended

Congressman Vestal, from the Committee on Coinage, Weights and Measures, has submitted the following report:

The Committee on Coinage, Weights and Measures having had under consideration the resolution extending the life of the National Screw Thread Commission for a period of two years from March 21, 1920, respectfully reports the same without amendment, with the recommendation that the resolution do pass.

The National Screw Thread Commission was appointed under the authority of an act approved July 18, 1918. This act was amended by an act approved March 3, 1919, slightly modifying the required qualifications of the personnel of the commission and extending the life of the commission for a year. The life of the commission will terminate automatically on March 21, 1920, if not extended.

The commission is composed of two representatives of the Army, two representatives of the Navy, and four civilians, nominated by the engineering societies of America, with Dr. Stratton, director of the Bureau of Standards, as chairman.

The members of the Screw Thread Commission serve without compensation other than the regular salary of the Army and Navy members and that received by the director of the Bureau of Standards.

The purpose for which the commission was created was to investigate, formulate and, after investigation, test and, upon approval, promulgate standards of commercial screw-thread practice.

The commission has practically completed its work, which, in the opinion of Director Stratton, is a work of wide and far-reaching effect. A tentative report was prepared about three months ago.

This report has been made accessible to the engineering and manufacturing industries and which has been subjected to the final test of actual use. It appears that the work of the commission is being accepted with satisfaction by the industries concerned, but that in a few instances it has been found by actual practice that slight adjustments or variations in certain particulars of the standards submitted should be made before the report in its final form is promulgated and the life of the commission terminated.

It is believed that it would be best to keep the commission in existence for the time named so that it may pass upon any question of adjustment or modification of the proposed standards.

The committee agrees to this all the more readily in view of the fact that no expense has been incurred by the commission and that none is contemplated as a consequence of the extension of time.

Trade Currents from New York, Cleveland and Chicago

CLEVELAND LETTER

A considerable decrease in machine-tool inquiries is noted in the Cleveland and northern Ohio territory during the last week or ten days. While the majority of manufacturers and dealers believe that this is the usual lull with the turn of the month, others are disposed to consider the rush of equipment business as having "gone over the top." There have been few cancellations during the week, but the amount of new business coming in is not very large.

There is dearth of inquiries for other than standard equipment. Special-machinery requirements have filled a big gap during the last few months, and the absence of this class of business at this time is noticeable.

More tool interests continue to plan for expansion. One of the latest plans in this direction is that by the Gardner-Bryan Co., manufacturer of taps, dies, screw plates and gages. This firm plans to double its output, and has acquired a three-story concrete building at 1876 East 18th St., this city. This building occupies a plot 120 x 40 ft. It is expected to be ready for manufacturing operation by the end of March. New equipment has been installed. Three times as much floor space will be available over the present downtown location. It is planned to double the operating staff in the next sixty days. More than fifty men will be employed on each floor. Officers of the company are: President, John M. Gardner; vice president, C. E. Gardner; secretary-treasurer, R. H. Smart. Mr. Smart is well known in the East in the machine-tool trade, having been for fifteen years connected with the Greenfield Tap and Die Co., Greenfield, Mass. He resigned about a year ago from the sales managership of the small-tool department of the Greenfield firm to take active charge of the business end of the Gardner-Bryan Co. here.

NEW YORK LETTER

Speculation as to the extent of railroad buying, now that the carriers have been returned to private ownership, is the chief topic of interest in machine circles at this writing.

Nothing definite can be ascertained as to the approximate amounts that will be appropriated by the various roads in the Alleghany region for machine tools, but the Baltimore & Ohio and the Pennsylvania have been recent purchasers of small lists. The New York Central is said to have issued a small list for a subsidiary concern, but is not in the market generally.

Heavy equipment orders have been placed in good volume. The Erie ordered forty-eight steel cars from the Pressed Steel Car Co. totalling $2,500,000. Twenty engines were ordered by the Boston & Maine. Western roads are also buying heavily.

Used machine tools are enjoying a brisk run. In the New York market, buyers are unwilling to wait for new machines if serviceable substitutes are to be found for spot delivery elsewhere.

Shapers lead the demand with few offered. Lathes from 24 in. to 36 in., radial drills, all sizes, and planers are in active demand. There is some demand for automatic screw machines, but so far dealers have been able to make promise of reasonable delivery.

Look Out
Don't Buzz with a Buzz Saw
Careless Ways Cause a Blaze
Be Careful
Play Safe
An Electric Shock May Make you Rock
A Wicked Nail May Make you Quail

Pipe machines for export were represented in an $11,000 order placed with the Fairbanks Co. by Cuban interests.

The Anaconda Copper Co. will issue a machine-tool list shortly, as will the Waterman Fountain Pen Company.

Repeated calls for woodworking machinery have almost cleaned the market of this class of equipment.

CHICAGO LETTER

Quiet conditions prevail throughout the Chicago district in the machine-tool trade. Dealers, on checking up February sales, find the month to have been very satisfactory. With all concerns, it far exceeds the same month a year ago and one firm reports it as having been the best month in its history.

Such a volume of business is on back orders that every one is assured of prosperity for some time to come, but there is no blinking the fact that inquiries and new orders are falling off materially.

Financial conditions do not seem to be causing the let-up in business nearly so much as is the shortage of raw materials. This condition is particularly true in regard to steel plates and sheets, which are practically non-existent, so far as spot stocks are concerned.

Local building conditions remain quiet. Except for a few minor shop and factory enterprises, nothing further of interest has been made public.

Last week the International Harvester Co. was making inquiry for twenty-five 18-in. lathes. It is understood that its need for this equipment is immediate and temporary.

Dayton Machinery Plant To Reopen

The Recording and Computing Machines Co.'s plant in Dayton, Ohio, will soon be opened again by the owner, William I. Ohmer, who will begin the production of magnetos, generators, batteries and automobile starters.

There has been a delay in getting the plant started after its war activities on account of the nonarrival of raw materials and inability to get the necessary machine tools finished.

Besides the production of the automobile accessories named above, part of the plant will be used for the manufacture of stereopticon machines and educational films for use in the home.

Buy Tool Works

The Lone Star Motor Truck and Tractor Association has purchased the entire holdings of the San Antonio Tool Works at 113 Nacional St, San Antonio, Tex. It is stated that a $50,000 addition to the Lone Star plant on Roosevelt Ave. will be constructed to house the new machinery. Lathes, milling and shaping machines, grinding machines and special devices adapted to the use and manufacture of automobile parts are included in the equipment acquired, including drop-forging machinery.

R. Rand, trustee for the Lone Star Association, said that no change in the operation of the tool works would be made before about the middle of March, when it is expected to move the machinery and tools to the Roosevelt Ave. plant. All employees of the tool works will be retained, he added, and its regular business carried on.

Austin and Linderman Plants Have Been Combined

The F. C. Austin Machinery Co. has been incorporated to take over the business of the F. C. Austin Co., Inc., the Municipal Enginering and Contracting Co., and the Muskegon plants of the Linderman Steel and Machine Co. The personnel of the combined companies will be retained. F. C. Austin will retire from active management as president of the Linderman Co. and B. A. Linderman will assume control. The offices of the combined companies will be continued in the Railway Exchange Building, Chicago, Ill.

Promotion of Westinghouse Electric Officials

The Westinghouse Electric and Manufacturing Company has announced the appointment of a number of promotions among its officials at East Pittsburgh. Among the more important of these are the following:

Alexander Taylor, for many years manager of works, has been made assistant to vice president in general charge in all plants of production, stocks and stores.

R. L. Wilson has been promoted from position of general superintendent to works manager of the East Pittsburgh Works.

E. R. Norris has been appointed director of works equipment, in charge of machinery, tools and methods in the various plants.

C. B. Auel is made manager of the employees' service department.

Other appointments announced were: G. M. Eaton has been made chief mechanical engineer of the company; C. W. Johnson and H. W. Cope, assistant directors of engineering; C. H. Champlain and E. S. McCelland, assistant works managers; John E. Bonham, assistant to works manager; E. S. Brandt, supervisor of equipment and methods.

The following were appointed as managers of the engineering departments indicated: A. M. Dudley, automobile equipment; R. P. Jackson, material and process; F. E. Wynne, railway equipment department; and G. H. Garcelon, small motor.

Frasse Steel Works Plans Additions to Cost $100,000

The Frasse Steel Works has completed plans for the reconstruction of the present plant at a cost of $100,000, in order to allow sufficient room for the business which the works has to care for. The new works will take over the New England business of the Peter A. Frasse Co. after the first of the year. The parent corporation was a New York company, while the new concern, which markets the greater part of its products in western New England, is incorporated under the laws of Connecticut for $1,000,000.

The additions to the Hartford plant will comprise an extension of the present shop building which will be 320 x 25 ft., and a building in front of the present office; the first two stories of which will be 175 x 90 ft., while the third story is to be 75 x 90 ft. On the railroad side of the plant there is now a loading platform 320 x 40 ft., which under the new plans is to be inclosed to provide more storage space for both raw material and for the finished products which are awaiting shipment.

The output of the plant is now 26,000 tons of finished work a year, which amount can be increased to 40,000 tons. The improvements will make possible the completion of 50,000 tons of work a year.

The directors of the new Connecticut corporation are: A. E. Brion, president; R. C. Stacy, vice president; Lester Brion, treasurer; R. K. Newman, secretary; Theodore Hager, Arthur B. Mead and Fred Becker. The new works plans to sell stock to such members of the executive force who are really permanent members of the staff, and who are desirous of investing in their own company. The original company, Peter A. Frasse Co., of New York, will act as the sales agents for the Connecticut corporation in the rest of the country while the company will handle its own New England business.

When the company located in this city several years ago it was only after a long consideration of the several New England manufacturing cities among which were New Haven, Bridgeport, Springfield and Worcester. Hartford was finally decided upon because it offered all the advantages of central location and rail communication which the company wanted.

Newly Incorporated Company Takes Over the Simplex Machine and Tool Co.

The Buckeye Drill and Lathe Co., recently incorporated with a capital of $300,000 by Cleveland capitalists, has taken over the plants and property of the Simplex Machine and Tool Co., of Columbus, Ohio. The principal plant is located in Marion Road, Columbus, with other plants at Richmond, Ind., and Hamilton, Ohio. The property was taken over from the receiver of the Simplex Machine and Tool Co., which was the Guaranty Title and Trust Co., of Cleveland. The Buckeye Drill and Lathe Co. has not been fully organized, but C. D. Gibson has been named vice president and is in charge of the plants. The new company plans to dismantle the plants at Hamilton and Richmond and move the best of the tools to the Columbus plant and dispose of the others. High-speed ball-bearing drills and upright drills will be manufactured. These lines were formerly made by the Kern Machine Tool Co., of Hamilton, Ohio. Toolroom lathes in two sizes will also be manufactured.

New Incorporations

F. J. Jwiebel, Raymond Lamm and Agnes M. Cronkite, Portland, Ore., have incorporated the Protecto Manufacturing Co. and will manufacture pumping machinery, pumps, motor vehicles, trucks and supplies.

The Jones-McCord Hardware Co., Baker, Ore., has been incorporated by H. G. McCord, Floyd T. Jones and N. N. Elliott. The new corporation will handle heating materials, hardware and farming machinery.

The American Machinery Corporation, Indianapolis, Ind., was recently incorporated and will manufacture machinery and tools. The directors of this new concern are Frank E. Garvin and William E. Garvin.

Changes in Personnel at Square D Co.

Several additions and changes in the sales and advertising departments of the Square D Co., of Detroit, Mich., became effective Feb. 1. E. A. Printz, formerly district sales manager of the Chicago territory, was made sales manager, A. MacLachlan continuing in the capacity of secretary and director of distribution. D. M. Stone, formerly district sales manager of the Pittsburgh territory, was made district sales manager of the Detroit territory. J. A. Jaques, formerly in charge of the New York territory as district sales manager, was given the district sales managership of the Pittsburgh territory, and H. W. Spahn, district sales manager of the Buffalo territory, was placed in charge of New York. D. H. Colcord, formerly of the department of publicity of the Westinghouse Air Brake Company of Pittsburgh, was appointed director of research engineering.

The annual sales conference of the Square D Co. will be held at the Hotel Statler, Detroit, Feb. 16, 17 and 18.

Obituary

PHILIP JOSEPH MCGUIRE, chief production manager of the Walter A. Wood Mowing and Reaping Machine Co., of Hoosick Falls, N. Y., died from pneumonia after an illness of less than a week, on Saturday, Feb. 14. Mr. McGuire had been with the Wood company for more than fourteen years, was deputy grand knight of local lodge K. of C., an officer in the Seth Parsons Steamer Co. and active in many city interests.

JOHN A. RANDOLPH, of the Westinghouse Electric and Manufacturing Co., died from pneumonia, at the Columbia Hospital, Wilkinsburg, Pa., on Friday, Jan. 30, 1920. Mr. Randolph was graduated from Syracuse University, Syracuse, N. Y., with the class of 1903. After graduating, he engaged in engineering and writing technical literature for trade magazines. Mr. Randolph was also engaged for a time in the activities of the Society for Electrical Development located in New York.

HARDY GREENWOOD, of Dallas, Tex., a representative of the Youngstown Sheet and Tool Co. and the J. B. Wise Co., Inc., of Watertown, in the Dallas section, died at the Sisters Hospital in Watertown from malaria on Feb. 18, 1920.

FREDERICK WARREN, head of the Atlantic Manufacturing Co., Milford, Conn., manufacturer of screw-machine work, died Feb. 18, from pneumonia, in the Bridgeport Hospital, after an illness of less than a week.

H. M. DAVIS, manager of the advertising department of the Sprague Electric Works of the General Electric Co., died on Feb. 9, 1920, after a lingering illness of about three weeks.

Business Items

The Acme Special Machine Manufacturing Co., Hartford, Conn., has been organized to deal in machinery, engines, etc.

The Manufacturer's Foundry Co., Cleveland, Ohio, has been organized by William Wynn, A. Kyle, George J. Downing, B. J. Russell and E. F. Marcha.

The Bethlehem Foundry and Machine Co., Bethlehem, Pa., makes the announcement that Robert E. Wilbur has been appointed as second vice president of the company.

The Steam Auto Truck Co., Superior, Wis., has completed its plans to establish a plant in Ogdensburg, N. Y., but owing to some patent litigation the company has been obliged to cancel them.

The Baker Gun and Forging Co., Batavia, N. Y., has sold its gun business to the H. & D. Talson Arms Co., New York City. The Baker Gun and Forging Co. will continue in the manufacture of automobile parts.

The Paul Welding Machine Co., 304-306 West Water St., Syracuse, N. Y., was recently destroyed by fire. The loss is about $35,000 to the plant and about $12,000 to $15,000 worth of special tools were destroyed.

The Fernwood Manufacturing Co., Dayton, Ohio, was recently incorporated and will manufacture and sell tools, dies, jigs and machinery. The incorporators are Carl F. Kuhls, Herman C. Kuhls Jr., Henry W. Kuhls, William G. Kuhls and Bernadine E. Kuhls.

J. B. Wise, Inc., manufacturer of brass plumbing supplies and specialty parts, has completed an addition of a one-story, 40 x 60-ft. building as an addition to its plant in Mill St. This new building will be equipped as a brass annealing room and is fitted with compressed-air cranes.

The Watertown Engine and Machine Co., Watertown, N. Y., has purchased the business of the Biltwell Guard Co., also of Watertown. The operation of this new department will be handled at the West Main St. plant. Claude L. Peck, one of the former owners of the Biltwell Guard Co., has been retained as manager for the new department.

The Spacke Machine and Tool Co., Indianapolis, Ind., is preparing plans for construction of a large factory on a 23-acre site at Oliver Ave. and the Belt railroad. The company manufactures Spacke axles, the Spacke motor and the Spacke motor car. Daniel S. Brooks, Indianapolis, Ind., is the president.

The Self Locknut and Bolt Co., of South Bend, Ind., is soon to move its plant to Syracuse, N. Y., and construction of a new plant is about to be started near East Syracuse, where the company has obtained 7½ acres of land. The plant of the Maywood Wagon Co. is temporarily being put in shape for production.

At the annual meeting of the stockholders of the Eagle Manufacturing Co., Appleton, Wis., on Jan. 26, 1920, the following officers were elected: A. W. Priest, president; A. H. Meyer, vice president; R. A. Raschig, secretary; E. W. Saiberlich, treasurer; Charles Hayden, general manager, and George L. Lorch, factory manager.

The Curtis & Curtis Co., of Bridgeport, Conn., manufacturer of pipe cutting and threading machinery, etc., has recently increased its capital stock from $200,000 to $1,200,000 in order to carry on a more extensive business.

The Anderson Forge and Machine Co., Detroit, Mich., has changed its corporate name to the Jefferson Forge Products Co. and will continue the manufacturing of drop-forgings and finished crankshafts. There will be no change in the personnel.

Personals

F. J. COYLE, formerly with the Fairbanks Co., Binghamton, N. Y., is now connected with the McRae Roberts Co., Detroit, Mich., as factory manager.

R. W. ELLINGHAM has resigned as works manager of the Heald Machine Co., Worcester, Mass., to take a similar position with the Van Norman Machine Tool Co., Springfield, Mass.

M. A. WERTMAN, formerly of the Dayton branch of the Biggs-Watterson Co., has been appointed sales manager of that company, with headquarters in the Cleveland branch of the company.

GEORGE H. AUSTIN, sales engineer for the Rivett Lathe and Grinder Co., has resigned this position and is now connected with the Fairbanks Co., of New York, in a similar capacity.

L. F. QUIGG has been appointed superintendent of the Franklin open-hearth furnaces and mills of the Cambria Steel Co., Johnstown, Pa. Mr. Quigg succeeds H. E. Townsend who recently resigned his position.

THOMAS STANION, director of safety and sanitation for the Aluminum Castings Co., Cleveland, gave the first of a series of ten-minute talks on "Shop Housekeeping and Safety First," before the Industrial Association of Cleveland, Hotel Olmsted, Feb. 24.

S. F. WALL, secretary and treasurer, and T. M. Olson, manager of the Michigan Tool Co., Detroit, Mich., have severed their connections with this company in order that they may give their entire time to the Continental Tool Works, which was recently organized by them.

C. D. PORTERFIELD, formerly a representative of the Colonial Steel Co., in the New York territory, has recently joined the sales force of the firm of Alfred Herbert, Ltd., 54 Dey St., New York City, and will handle this firm's steel and small tool lines in the metropolitan district and New York State.

H. C. SEAMAN, associated with the E. W. Bliss Co., Brooklyn, N. Y., for more than thirty years—twelve years as secretary and treasurer and the last two or three as a director—has resigned from this company to accept the presidency of the Mid-Texas Oil and Refining Co. Mr. Seaman will make his headquarters at Fort Worth, Tex., and 379 Fifth Ave., New York City.

[The item published in our Feb. 5 issue regarding Mr. Seaman's resignation is incorrect.]

J. B. SMYTHE, formerly superintendent for A. O. Norton, Ltd., Coaticook, Quebec, Canada, is now with the Foss Machinery Co., as general manager of its new office and showrooms at 174 Lafayette St., New York City.

Forthcoming Meetings

The National Federation of Construction Industries will hold its first annual meeting at the Hotel Sherman, Chicago, March 24-25. John C. Frazee, Drexel Building, Philadelphia, is executive secretary.

The American Welding Society will hold its annual meeting at the Engineering Societies Building, 33 West 39th St., New York City, on Apr. 22, 1920, at 10:30 a.m. Howard C. Forbes is the secretary.

The National Metal Trades Association will hold a convention at the Hotel Astor, New York City, on April 19 to 22, 1920. H. D. Sayre is the secretary.

The National Chamber of Commerce will meet in Atlantic City, N. J., on April 26, 27 and 28.

The American Supply and Machinery Manufacturers' Association, the Southern Supply and Machinery Dealers' Association and the National Supply and Machinery Dealers' Association will meet jointly on May 17, 18 and 19 at Atlantic City, N. J., at the Hotel Marlborough-Blenheim.

The National Machine Tool Builders' Association will hold its spring meeting on May 20 and 21 at the Hotel Traymore, Atlantic City, N. J.

The spring meeting of the American Iron and Steel Institute will be held May 28 at the Hotel Commodore, New York.

The American Society for Testing Materials will hold its next annual meeting during the week of June 21, 1920, at the New Monterey Hotel, Asbury Park, N. J. This society has its headquarters in the Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa. C. L. Warwick is the secretary and treasurer.

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month, alternating with the Employers' Association of Eastern Massachusetts. George D. Berry, secretary, room 50-51, 166 Devonshire St., Boston, Mass.

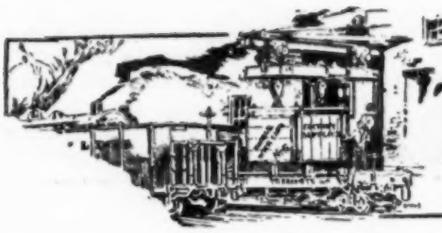
Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month. Lewis H. Kenney is the chairman of committee on papers.

Electric Hoist Maufacturers' Association. Monthly meeting at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Pa.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Pa., Howard Evans, secretary, Pier 45, North Philadelphia, Pa.

Rochester Society of Technical Draftsmen. Monthly meeting 1st Thursday. O. L. Angevine, Jr., secretary, 547 Arnett Boulevard, Rochester, N. Y.



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$44.60	$39.10
Northern Basic	42.80	38.20
Southern Ohio No. 2	43.80	40.80
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	47.65	45.65
Southern No. 2 (Silicon 2.25 to 2.75)	47.70	43.20
BIRMINGHAM		
No. 2 Foundry	41.00	35.50
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	45.35-45.65*	42.50*
Virginia No. 2	43.25*	40.00*
Basic	43.00†	40.00†
Grey Forge	42.50*	39.50*
CHICAGO		
No. 2 Foundry local	43.25	40.00
No. 2 Foundry, Southern	46.60	40.50
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	43.65	39.40
Basic	42.90	36.40
Bessemer	43.40	37.40
MONTREAL		
Silicon 2.25 to 2.75%	43.25	.....

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.97	$3.47	$4.07	$5.50	$3.97	$3.47	$4.07
Soft steel bars	4.12	3.52	3.97	5.00	4.07	3.52	3.97
Soft steel bar shapes	4.12	3.52	3.97		4.07	3.52	3.97
Soft steel bands	4.82	4.22	4.57	6.25	.....	.....	.....
Plates, ¼ to 1 in. thick	4.17	3.67	4.27	5.00	4.47	3.67	4.27

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.00	$2.90
Warehouse, New York	3.52	4.17
Warehouse, Cleveland	3.42	3.90
Warehouse, Chicago	3.52	4.10

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Large Mill Lots	New York			
Blue Annealed	Pittsburgh	Current	One Year Ago	Cleveland	Chicago
No. 10	3.55-4.00	5.57-6.80	5.17	7.30	5.27
No. 12	3.60-4.05	5.62-6.85	5.22	7.40	5.32
No. 14	3.65-4.10	5.67-6.90	5.27	7.45	5.37
No. 16	3.75-4.20	5.77-7.00	5.37	7.55	5.47
Black					
Nos. 18 and 20	4.15-4.80	6.80-7.30	6.02	7.95	6.30
Nos. 22 and 24	4.20-4.85	6.85-7.35	6.07	8.00	6.35
No. 26	4.25-4.90	6.90-7.90	6.12	8.05	6.40
No. 28	4.35-5.00	7.00-8.00	6.22	8.15	6.50
Galvanized					
No. 10	4.70-6.00	7.50-9.00	8.22	8.50	6.65
No. 12	4.80-6.10	7.60-9.10	8.27	8.60	6.70
No. 14	4.80-6.10	7.60-9.10	8.42	8.60	6.85
Nos. 18 and 20	5.10-6.40	7.90-9.40	8.72	8.90	7.15
Nos. 22 and 24	5.25-6.55	8.05-9.55	7.12	9.05	7.55
No. 26	5.40-6.70	8.20-9.70	7.27	9.20	7.70
No. 28	5.70-7.00	8.50-10.00	7.57	9.50	8.00

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.50	$5.40	$5.50
Flats, square and hexagons, per 100 lb. base	6.00	5.90	5.50-6.00

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	55
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00-26.00	$25.50-30.00
Cleveland	20.00	20.00
Chicago	16.50	16.50

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
⅛, 11, 9, 7, 5, 4	21.00 to 30.00	⅛ by 12 in. long	14.00
No. 8, 3 and No. 10		¼ by 19 in. long	12.00
2		⅜ by 19 in. long	10.00
No. 12		½ by 21 in. long	10.00
1, No. 14 and 0		Special Welding Wire, Coated	
No. 18		⅛	33.00
No. 20		¼	30.00
Domestic 20c. for ⅛, 15c. for ¼ to 0		⅛	38.00

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	8.00
Spring steel (light)	8.00	11.00	11.00
Coppered bessemer rods	8.00	8.00	6.75
Hoop steel	4.47	6.50	4.32
Cold-rolled strip steel	11.50	8.25	8.00
Floor plates	6.55	6.00	6.27

PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	47%	20½%	⅛ to 1¼	34½%	18½%
½	51%	36½%			
¾ to 3	54%	41½%			

LAP WELD

2	47%	34½%	2	28½%	14½%
2½ to 6	50%	37½%	2½ to 6	30½%	17½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	43%	25½%	⅛ to ⅜	34½%	19½%
½	48%	35½%			
¾ to 1¼	52%	39½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	45%	33½%	2	29½%	16½%
2½ to 4	48%	36½%	2½ to 4	31½%	19½%
4½ to 6	47%	35½%	4½ to 6	30½%	18½%

Stock discounts in cities named are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
⅛ to 3 in. steel butt welded	40%	24%	40%	31%	54%	40½%
2½ to 6 in. steel lap welded	35%	20%	42%	27%	50%	37½%

Malleable fittings, Class B and C, banded, from New York stock sell at plus 23%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.00	19.25	16.00
Tin in 5-ton lots	64.00	63.00	72.50
Lead	9.53	9.00	5.25
Spelter	9.50	9.625	6.75
ST. LOUIS			
Lead	8.375	8.375	5.00
Spelter	9.225	9.225	6.40

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

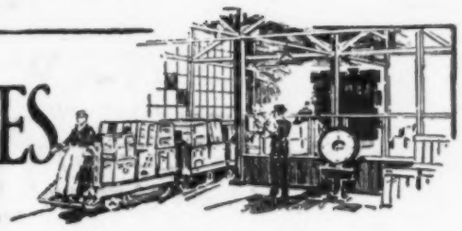
	New York			Cleveland		Chicago	
	Current	Month Ago	Year Ago	Current	Year Ago	Current	Year Ago
Copper sheets, base	29.50	29.50	24.50	31@32	25.50	36.00	32.00
Copper wire (carload lots)	29.25	29.25	25.00	29.50	24.00	27.00	28.50
Brass sheets	26.50	26.50	20.50	29.00	26.00	27.00	29.00
Brass pipe	32.00	32.00	30.00	34.00	35.00	35.00	37.00
Solder (half and half) (case lots)	39.00	39.00	36.50	40.50	41.50	38.00	39.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	18.50
New York	23.75	19.50
Cleveland	29.00	25.00
Chicago	26.00	28.00

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 12.00

	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.00	14.45	15.50	14.80
New York	14.00	12.00	14.50	13.00
Chicago	15.00	22.00	15.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	12.00	7.50
Chicago	12.50	8.50
Cleveland	13.00	10.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	— New York —		—Cleveland—		
	Current	One Year Ago	Current	One Year Ago	Chicago
Copper, heavy, and crucible	16.50–17.00	14.75	17.50	14.00	17.50
Copper, heavy, and wire	16.00 16.50	14.00	17.00	13.00	16.50
Copper, light, and bottoms	15.00 15.50	11.50	15.50	11.00	15.50
Lead, heavy	6.75 7.00	4.00	7.50	4.00	8.25
Lead, tea	6.00 6.25	3.00	5.50	3.00	7.00
Brass, heavy	11.50 12.00	8.50	14.00	8.00	17.00
Brass, light	9.00 9.50	7.00	10.50	6.00	11.00
No. 1 yellow brass turnings	9.50 10.00	9.00	11.00	6.50	11.50
Zinc	6.00 6.25	4.50	6.00	3.50	7.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00	34.00c.@35.00c.	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	33.00	27.00
Chicago	29.00	38.00
Cleveland	32.00	28.00

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	87.00	73.00	77.00	70.00	75.00
Commercial	50.00	42.00	21.50	18.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York —		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+$2.00	.80	$1.00	$1.25	$1.25	.98
Hot pressed hexagon	+ 2.00	.80	1.00	1.10	1.25	.78
Cold punched hexagon	+ 2.00	2.50	1.00	1.00	.90	1.00
Cold punched square	+ 2.00	2.50	1.00	1.00	.90	1.00

Semi-finished nuts, $\frac{7}{16}$ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	60%	50–10%
Chicago	50%	50%
Cleveland	55%	60%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	25%	40+5%	35–5%
Larger and longer up to 1¼ in. by 30 in.	15%	30%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... $1.50 Cleveland..... $4.50 Chicago..... $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $3.75 Chicago..... $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	15%	40%	30%
Larger and longer up to 1 in. by 30 in.	5%	20+10%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	List	30%	List
Chicago	10%	List	10%	List plus 20%
New York	10%	40% from list	10%	20% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	30%	45%	45%
Tinned	30%	45%	45%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$6.00 Cleveland...$4.00 Chicago....$4.97 Pittsburgh...$4.72

Structural, same sizes:

New York...$6.10 Cleveland...$4.10 Chicago....$5.07 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	33.50	36.00	35.00
Brass	32.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb. advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb. 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ⅛-2 in. inclusive in rounds, and ⅛-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	NEW YORK			
	Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00–13.00	16.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	52.00	53.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.75
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.25	4.25	3.62
Chicago	5.00	5.00	4.125

COKE—The following are prices per net ton at ovens, Connellaville:

	Mar. 4	Febr. 26	Feb. 19	Feb. 12
Prompt furnace	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

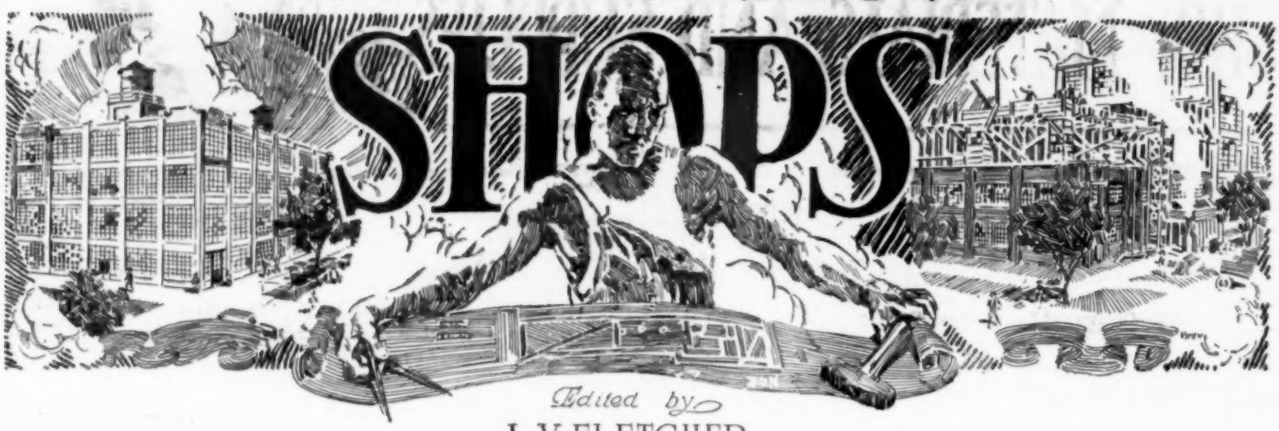
	— New York —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.80	$1.50	$1.98	$1.66
5-gal. cans	2.00	1.65	2.23	1.86

WHITE AND RED LEAD—Base price per pound:

	— Red —				— White —	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discount.

NEW and ENLARGED



Edited by
L·V·FLETCHER

Machine Tools Wanted

The following concerns are in the market for machinery and machine tools.

Conn., New Haven—The Cameron Motors Co.—general equipment for the manufacture of automobile trucks.

Md., Baltimore—The New Idea Press, 1507-11 Ashland Ave.—14 in. shaper.

N. J., Belleville—The Overman Cushion Tire Co., Cortlandt and Rutgers Sts.—sensitive drill equipment.

N. J., Helmetta—The Helmetta Snuff Co.—one 42 in. boring mill.

N. Y., New York (Borough of Brooklyn)—The Adriance Machine Wks., 80 Richards St.—two 2 spindle sensitive drilling machines.

N. Y., New York (Borough of Manhattan)—S. Blickman, 199 Lafayette St.—swaging machine for seamless tube ends.

N. Y., New York (Borough of Manhattan)—E. V. Galen, 14 Irving Pl.—One 2 x 24 Jones & Lamson turret lathe.
Two No. 2 Kempsmith Universal millers.
Four ⅜ to 1 in. automatic screw machines.

N. Y., New York (Borough of Manhattan)—Mayer & Lage, 120 Broadway—Textile machinery looms, for Hartman Wiggins Reimers.

N. Y., New York (Borough of Manhattan)—Morey & Co., Lafayette and Broome Sts.—
One 60 in. vertical boring mill.
One 84 in. vertical boring mill.
One 6 ft. radial drill.
One 800 lb. steam hammer.
One 1½ in. x 1 in. capacity double end punch and shear.
Four No. 2 B. & S. automatic screw machine.

N. Y., New York (Borough of Manhattan)—The Natl. Conduit and Cable Co., 41 Park Row—No. 2 Universal miller, vertical attachment, cam milling attachment, and accessories.

N. Y., New York (Borough of Manhattan)—The New York Salvage Corp., 115 West 23rd St.—1,000 black annealed iron sheets, 30 in. wide.

N. Y., New York (Borough of Manhattan)—The Northwestern Eng. Wks., Singer Bldg., 149 Broadway—
One 66 in. boring mill; Bullard, N. B. P. or Cincinnati.
1 gear hobber, work 5 to 48 in., cut diametrical pitch of 1½ in. (Adams, Farwell or similar).
1 gear planer (Gleason) to take bench gears up to 22 in.
One 12 in. x 6 ft. Universal lathe.
1 set plate bending rolls (not specified).

N. Y., New York (Borough of Mantattan)—L. Roca, Agt. A. W. Willman, 160 Broadway—1 automatic hair pin machine and a 40 kw. "Diesel" or "Standard" generating set.

N. Y., New York (Borough of Manhattan)—The Wager Furnace Bridge Wall Co., 149 Broadway—
1 turret lathe (about 1 B Universal).
1 engine lathe (20 in. x 14 ft.).
1 42 in. planer.

N. Y., Phelps—The Phelps Foundry Co., Inc. c/o W. R. Shover, 21 Harrison St., Rochester—foundry equipment.

N. Y., Salamanca—F. A. Forness—machine tools for garage repair work.

N. Y., Schenectady—The Genl. Electric Co.—1 duplex horizontal drill, equivalent to Garvin No. 0 and 1 plain horizontal drill, equivalent to Garvin No. 00.

N. Y., Troy—The Interstate Mchy. Co., 3104 7th Ave.—plane miller of No. 2 Kempsmith or No. 3 Le Blond type or similar.

Pa., Philadelphia—F. D. Mensing, 1713 Sansom St.—heavy duty turret lathes.

Pa., Philadelphia—The O'Brien Mchy. Co., 119 North 3rd St.—large boring mills and 36 in. planers with two heads.

La., New Orleans—The New Orleans Motor Truck Co., Tchoupitoulas and Valmont Sts.—bench and sheet metal working equipment for the manufacture of motor trucks.

La., New Orleans—The Surgical Supply Co., 1425-27 Canal St.—lathe, drill press, milling machines, buffing machines and complete nickel plating equipment.

W. Va., Wheeling—C. L. Hills, 305 Natl. Bank Bldg.—3 to 4 ft. radial drill, plain or Universal.

Ill., Aurora—The Stephens Adamson Mfg. Co., Ridgeway—30 in. heavy duty pulley lathe with standard tailstock (new).

Ill., Belvidere—The Natl. Sewing Machine Co.—two 24 spindle multi spindle drill presses. Capacity up to ⅝. Minimum drill No. 61.

Ill., Blue Island—Libby, McNeill & Libby, 38 South Dearborn St., Chicago—10 lines of ½-2½ and 3 lb. sanitary can making machinery.

Ill., Chicago—The Genl. Stamping and Mfg. Co., 1652 West Belmont St.—punch press.

Ill., Chicago—The International Harvester Co., 606 South Michigan Ave.—twenty-five 18 in. lathes.

Ill., Chicago—The Steel and Tube Co. of America, 111 West Washington St.—42 in. roll lathe (new).

Ill., Galva—The Hayes Pump and Planter Co.—Lincoln or manufacturing milling machine for milling keyseats on shafts in gangs or multiples capable of taking 6½ in. keyseats at one time.

Ill., Grand Crossing (Chicago P. O.)—The Cochran Mfg. and Forging Co.—power hammers, 200 to 800 lbs.

Ill., Springfield—The United Supply Co.—No. 0 B. & S. automatic screw machines.

Ill., Waukegan—The H. W. Johns-Manville Co., 201 Clybourne St., Milwaukee—machinery for the manufacture of asbestos.

Ind., Indianapolis—The Indianapolis Pressed Steel Co., 5420 Broadway—power squaring shears of ⅛ to ¼ in. x 6 ft. capacity also slitting shears up to ⅜ in. capacity.

Mich., Albion—The Albion Bolt Co., c/o C. G. Watson—bolt headers and equipment for the manufacture of bolts.

Mich., Albion—The Hayes Wheel Co.—miscellaneous machine shop equipment and equipment for forging wheel hubs.

Mich., Albion—The Union Steel Products Co., Ltd.—No. 5 or No. 6 Bliss punch press or its equivalent, a horn press equal to a Bliss No. 6 and two small Baird bench type power presses (new or used).

Mich., Buchanan—The Clark Equipment Co.—engine lathes and shapers.

Mich., Detroit—The Deford Motor Co., 817 Cass Ave.—machine tool equipment for repair work.

Mich., Detroit—The Ewing Bolt and Screw Co., 403 Farwell Bldg.—bolt headers, screw machines and general equipment for the manufacure of screws, bolts, nuts and rivets.

Mich., Detroit—The C. M. Hall Lamp Co., Hancock and Rivard Sts.—miscellaneous presses and equipment for the manufacture of automobile lamps.

Mich., Detroit—E. Langley, 38 Buhl Block—1 circular saw (wood) with gas engine equipment.

Mich., Detroit—The Liberty Machine Co.—machine shop equipment, including grinders, lathes and screw machines.

Mich., Jackson—The J. J. Case Threshing Machine Co.—Erie or similar, steam hammers.

Mich., Kalamazoo—Moulton & Dalgleish, West Main St.—small tools for service department.

Mich., Muskegon Heights—The Shaw Electric Crane Wks., c/o L. E. Stear—machines for use in the manufacture of cranes and hoists.

Mich., Muskegon—The Continental Motors Corp., Water and Market Sts.—several disc grinding machines (new).

Mich., Niles—The Natl. Standard Co.—double end disc grinder to handle 18 in. discs (used).

Mich., Owosso—The Field Mfg. Co.—equipment for the manufacture of automobile truck bodies.

O., Cleveland—C. J. Bath & Co., 721 St. Clair Ave., N. E.—radial drills, Universal milling machines and shapers (used).

O., Cleveland—The Biggs Watterson Co., 1235 West 9th St.—No. 6 Warner and Swasey screw machine, 5 vertical spring mills, late pattern, with from 48 to 72 in. swing and a No. 242 Niagara squaring shears (new or used).

O., Cleveland—The Merit Machine Co., Euclid Ave. and East 152nd St.—machinery for the manufacture of automobile parts.

O., Cleveland—The Morrison Garage Co., 10516 Morrison Ave.—9 to 12 in. swing lathe, 1¼ to 2 hp. emery wheels on motor, single phase, 220 volt.

O., Columbus—The Columbus Vending Co., 2005 East Main St.—punch presses, weighing 2,800 to 3,000 lb.

O., Columbus—The Progressive Die and Tool Co., 600 North High St., H. G. Gray, Genl. Mgr.—three 21 in. lathes, 1 boring machine, a vertical and a horizontal shaper.

O., Sandusky—The Erie Tire and Rubber Co., Park Ave.—5 bob tail lathes, 36 to 50 in., motor or belt drive (new or used).

Wis., Brandon—P. W. Atwood—hemp making machinery.

Wis., Cudahy—The Ladish Drop Forge Co., Packard Ave.—die making machinery.

Wis., Milwaukee—The Amer. Metallic Shower Bath Co., 710 Pabst Bldg.—machinery for the manufacture of metal shower baths.

Wis., Milwaukee—G. Gerlinger, 192 Milwaukee St.—an automatic screw machine.

Wis., Milwaukee—The Milwaukee Automobile Specialty Mfg. Co., 711 Chestnut St.—machine tools.

Wis., Milwaukee—The Milwaukee Die Casting Co., 297 4th St.—die making machinery.

Wis., Milwaukee—The Northwestern Bridge and Iron Co., 32nd and Hopkins Sts.—automobile repair equipment.

Wis., Milwaukee—The Post Office Garage, Milwaukee and Huron Sts.—garage repair machinery.

Wis., Milwaukee—J. J. Stenger, 911 Center St.—presses, hammers and die making machinery.

Wis., Milwaukee—The T. M. E. K. & L. Co., 2nd and Sycamore Sts.—miller.

Wis., Milwaukee—W B. Uihlein, 3rd and Galena Sts.—complete machine shop equipment.

Wis., Milwaukee—O. T. Webb, 224 4th St.—woodworking machinery.

Wis., Milwaukee—The West Side Sheet Metal and Furnace Wks., 2451 Walnut St.—sheet metal working machinery.

Wis., Milwaukee—The Wisconsin Parlor Frame Co., 536 Lapham St.—a wood turning lathe and a sander source.

Wis., Oostburg—The Dutch Canning Co.—canning machinery.

Wis., Oshkosh—The Oshkosh Motor Truck Co., High and Forest Sts.—machinery for the manufacture of motor trucks. (new or used).

Wis., Sheboygan—Bd. Educ.—lathes and woodworking machinery.

Minn., St. Paul—The Great Northern R. R.—one 90 in. high duty tire turning lathe, one 44 in. vertical boring mill, one 30 x 30 in. x 6 ft. standard planer, one 20 in. x 12 ft. bed engine lathe, one 20 in. high duty shaper, one twist drill grinder and one pipe threading machine to take from ⅛ to 4 in. material.

Mo., St. Louis—The Traffic Motor Co., 5200 North 2nd St.—complete machine shop equipment.

Mo., St. Louis—The Watters Corp., Overland Bldg.—
One No. 7-A Bliss double crank press.
One No. 25 double crank press.
Three No.5 Niagara presses or Bliss presses of equal size.
Two No. 20 Bliss presses.
One No. 24 Foracute press or Bliss press of equal size.
Three No. 2 B. & S. automatic screw machines.
Two No. 0 B. & S. automatic screw machines.
One No. 00 B. & S. automatic screw machines.
One No. 0 B. & S. automatic cutoff machine.
Two No. 2 B. & S. automatic turret forming machines.
Two No. 4 Niagara or Bliss presses of equal size.
Three No. 5 Niagara or Bliss presses of equal size.
Two No. 20 or 20½ Bliss presses.
One No. 4 Faracute press.

Tex., San Antonio—A. B. Frank & Co., 210 West Commerce St.—4 h.p. combination woodworker for cutting forms and planing boards.

Cal., Long Beach—The Toasted Products Co., c/o J. A. Rominger, 116 Locust Ave.—grinders, conveyors, etc.

Cal., San Francisco—L. Lewin, 907 Rialto Bldg.—tools for automobile repair work.

Ore., Salem—The Spaulding Logging Co., Oregonian Bldg.—cutoff saws, circle saws, bands, trimmers, etc.

Wash., Kelso—E. L. Stoneson and Associates—lathe machinery, saws, cutters, etc.

N. B., St. John—The Canadian Cottons Co.—textile machinery.

Ont., Ottawa—The Heliotype Co., Ltd.—two litho machines, flat bed, 28 x 42 in., one 36 or 42 in. power cutter, 1 rotary card slitter and one large process camera and lens.

Ont., Toronto—The Anglo-Canadian Metals, Ltd., 52 Spadina St.—3 punch presses, No. 18 Bliss or equivalent. (new or used).

Ont., Toronto—The J. Bradford Co.—rotary card cutter, capacity 100,000 cards per 8 hrs.

Que., Montreal—The Northern Electric Co., St. James St.—engine and turret lathes, automatic screw machines, millers, Hendy, B. & S. and Cincinnati, respectively, preferred.

Metal Working

NEW ENGLAND STATES

Conn., Bristol—Bd. Educ. will soon award the contract for the construction of a school on King St., to include a manual training department. W. P. Crabtree, 272 Main St., New Britain, Archt.

Conn., Danbury—The Danbury Roller Bearing Co., c/o Sunderland & Watson, Archts., 248 Main St., has awarded the contract for the construction of a 2 story, 55 x 85 ft. factory, for the manufacture of ball bearings. Estimated cost, $25,000.

Conn., Fairfield—The Bullard Eng. Wks., Inc., Brewster St., has awarded the contract for the construction of a 1 story, 90 x 210 ft. forge shop. Estimated cost, $85,000.

Conn., Hartford—R. J. Kinsella, c/o F. C. Walz, Archt., 348 Trumbull St., will soon award the contract for the construction of a 2 story, 60 x 150 ft. garage, on South Main St. Estimated cost, $70,000.

Conn., New Britain—The Amer. Eng. Co., 200 East Main St., will soon award the contract for the construction of a 1 story, 40 x 65 ft. forge shop. Estimated cost, $14,000. L. A. Aldershow, 259 Main St., Archt.

Conn., New Haven—I. Mitery, 691 State St., plans to build a 1 story, 40 x 188 ft. garage. Estimated cost, $25,000. C. H. Abramowitz, 42 Church St., Archt.

Conn., Waterville (Waterbury P. O.)—The Chase Metal Wks., will build a 2 story, 40 x 51 ft. addition to its plant, on Thomaston Ave. Estimated cost, $15,000.

Mass., Boston—The Mason Regulator Co., 1605 Hyde Park Ave., has awarded the contract for the construction of a 2 story, 40 x 80 ft. factory, on Medway St. Estimated cost, $75,000.

Mass., Charlestown (Boston P. O.)—Crosby Steam Gage and Valve Co., 40 Central St., Boston, is having plans prepared by Lockwood, Greene & Co., Engrs. and Archts., 60 Federal St., Boston, for the construction of a 1 story, 48 x 104 ft. addition to its foundry. Estimated cost, $32,000.

Mass., East Boston (Boston P. O.)—M. J. Mastrangelo, Archt., 2 North St., is preparing plans for the construction of a 2 story, 70 x 175 ft. garage, on Custer St. Estimated cost, $50,000. Owner's name withheld.

Mass., Lynn—The Genl. Electric Co., has awarded the contract for the construction of a 3 story, 60 x 100 ft. addition to its plant. Estimated cost, $50,000.

Mass., Newton Upper Falls—The Saco Lowell Shops has awarded the contract for the construction of a 1 story, 200 x 335 ft. foundry, for the manufacture of cotton machinery. Estimated cost, $450,000. Noted Feb. 19.

Mass., Revere (Boston P. O.)—O. F. Farley, Jr., 27 State St., Boston, has awarded the contract for the construction of a 1 story garage. Estimated cost, $45,000.

Mass., Rockland—H. B. Vesper, c/o J. W. Beal, Archt., 62 Summer St., Boston, will soon award the contract for the construction of a 1 story, 140 x 145 ft. garage, on West Water St., here. Estimated cost, $60,000.

Mass., Springfield—The Packard Motor Car Co., 832 State St., plans to build a 2 story, 100 x 200 ft. garage and showroom. Estimated cost, $150,000.

Mass., West Springfield (Springfield P. O.)—The Gilbert & Barker Mfg. Co., Coldsprings Ave. manufacturer of pumps etc., will soon award the contract for the construction of a 1 story, 80 x 400 ft. brass foundry, a 2 story, 100 x 150 ft. and a 1 story, 160 x 180 ft. storehouse, a 1 story 40 x 80 ft. zinc building and a 1 story, 160 x 230 ft. sheet metal building. Estimated cost, $750,000. McClintock & Craig, 33 Lyman St., Springfield, Engrs.

R. I., Providence—The Autocar Sales and Service Co., 302 Pearl St., plans to build a 1 story, 120 x 165 ft. garage and service station, on Adelaide Ave. Estimated cost, $75,000.

R. I., Providence—The Chandler Motor Co. of Rhode Island, 213 Broad St., plans to build a 1 story, 50 x 100 ft. garage and service station on Pearl St. Estimated cost, $25,000; G. Henshaw, 87 Weybosset St., Archt.

R. I., Providence—E. J. Sullivan, 56 Larch St., plans to build a 1 story, 50 x 100 ft. garage, on Pine St. Estimated cost, $25,000. B. S. Martin, 86 Weybosset St., Archt.

MIDDLE ATLANTIC STATES

Del., Wilmington—The Automobile Supply Co., c/o Greisler & Abramson, Archts., Lafayette Bldg., will soon award the contract for the construction of a 3 story, 40 x 70 ft. automobile service building, on 12th and French Sts. Estimated cost, $50,000.

Md., Baltimore—The Reus Bros. Co., 146 West Mt. Royal Ave., manufacturer of automobile specialties, has awarded the contract for the construction of a 1 story, 100 x 240 ft. factory, on Kate Ave. along the tracks of the Western Maryland R.R. Estimated cost, $75,000.

Md., Canton (Baltimore P. O.)—The Baltimore Copper Smelting and Rolling Co., 4th Ave. and 5th St., plans to build a 1 story, 204 x 329 ft. copper rolling mill, on 1st and 2nd Sts. and 3rd Ave. Estimated cost, $130,000.

Md., Forest Park (Baltimore P. O.)—The Forest Park Garage Inc., Berwyn Ave., will soon award the contract for the construction of a 1 story, 116 x 136 x 143 ft. garage, on Liberty Heights and Berwyn Aves. Estimated cost, $60,000. E. H. Browne, 219 Courtland St., Archt.

N. J., Jersey City—The American Can Co., Communipaw Ave., plans to build an addition to its plant. Estimated cost, $500,000.

N. J., Newark—The Universal Tobacco Machine Co., 98 Murray St., has awarded the contract for the construction of a 1 story, 100 x 200 ft. and a 2 story, 35 x 100 ft. addition to its plant. Estimated cost, $115,000.

N. Y., Buffalo—The United States Roller Bearing Co., Ellicott Sq., manufacturer of bearings, plans to build a 40,000 sq.ft. factory, to have a daily capacity of 8,000 bearings. C. A. Sarber, Pres.

N. Y., Coney Island—Estate of J. & M. Hennot, 44 Court St., will build a 1 story, 105 x 175 ft. garage, on Coney Island Ave. Estimate cost, $30,000.

N. Y., New York (Borough of Brooklyn)—The G. & G. Constr. Co., 1399 St. John's Pl., will build a 1 story, 100 x 100 ft. garage, on 40th St. and 3rd Ave. Estimated cost, $35,000.

N. Y., New York (Borough of Brooklyn)—M. Friedman, c/o P. Caplan, Archt., 16 Court St., will build a 1 story, 100 x 100 ft. garage, on 33rd St. Estimated cost, $35,000.

N. Y., New York (Borough of Brooklyn)—W. A. Henchel, 424 75th St., will build a 1 story, 190 x 200 ft. garage, on 8th Ave. Estimated cost, $40,000.

N. Y., New York (Borough of Brooklyn)—The Hygrade Homes Co., 1203 Atlantic Ave., will build a 1 story, 75 x 275 ft. garage, on Dean St. near Classon Ave. Estimated cost, $45,000.

N. Y., New York (Borough of Brooklyn)—W. P. Jones, c/o Parfitt Bros., Engrs., 26 Court St., has awarded the contract for the construction of a 2 story garage, at 241 Waverly Ave.

N. Y., New York (Borough of Brooklyn)—A. Kaplan, 718 St. Marks Ave., will build a 1 story, 138 x 180 ft. garage, on Atlantic and Franklin Aves. Estimated cost, $75,000.

N. Y., New York (Borough of Brooklyn)—Lowenstein & Loeb, 833 St. John's Pl., will build a 1 story, 50 x 185 ft. garage, on Sterling Pl. and Classon Ave. Estimated cost, $20,000.

N. Y., New York (Borough of Manhattan)—The Prince & Mulberry Garage Corp., 299 Broadway, will build a 1 story, 95 x 100 ft. garage, at 249 Mulberry St. Estimated cost, $40,000.

N. Y., New York (Borough of Manhattan)—V. Valentine, 2165 Creston Ave., will build a 1 story, 75 x 100 ft. garage, at 307 East 97th St. Estimated cost, $25,000.

N. Y., Ogdensburg—Williams & Johnston, Archts., will soon award the contract for the construction of a 25 x 45 ft. garage, a 79 x 130 ft. foundry building and a 73 x 289 ft. factory, on Green St. Estimated cost, $100,000.

Pa., Allentown—City plans to build a 2 story, 40 x 100 ft. garage, on Main St. Estimated cost, $50,000.

Pa., Erie—H. W. Davis & Co., 56 Pine St., New York City, with a capital of $300,000 has acquired the plant and interests of the Williams Tool Co., here, manufacturers of the Williams Pipe Threading Machine, and plans to enlarge and double the present capacity of the plant.

Pa., Johnstown—W. S. Smith, will soon award the contract for the construction of a 2 story, 110 x 150 ft. garage and service station, on Somerset and Franklin Sts., for the Cambria Automobile Co., 230 Bedford St. Estimated cost, $100,000.

Pa., Philadelphia—C. E. Biddle, 1105 Real Estate Trust Bldg., will build a 1 story, 40 x 95 ft. garage, on 52nd and Pentridge Sts. Estimated cost, $10,000.

Pa., Philadelphia—The Keystone Automobile Top Co., 1412 Fairmount St., is having plans prepared by Le Roy B. Rothchild, Archt., 1225 Sansom St., for the construction of a 4 story, 80 x 140 ft. factory, on Fairmount and 17th Sts., for the manufacture of automobiles.

Pa., Philadelphia—L. J. Kolb, c/o H. B. Weldon, Archt., Fuller Bldg., has awarded the contract for the construction of a 1 and 2 story, 40 x 160 ft. and 25 x 160 ft. sales and service station, at 901 North Broad St. Estimated cost, $50,000.

Pa., Philadelphia—W. B. McCullough, c/o C. E. Oelschlager, Archt., 1615 Walnut St., has awarded the contract for the construction of a 2 story, 36 x 100 ft. service station, at 250 North Juniper St. Estimated cost, $30,000.

Pa., Wilkes-Barre—The Economy Automobile Co., 80 Main St., has awarded the contract for the construction of a 2 story, 50 x 225 ft. garage. Estimated cost, $90,000.

Pa., Wilkes-Barre—The Keystone Bolt Co., State St., will soon award the contract for the construction of a 1 story, 50 x 100 ft. factory, on South State St. Estimated cost, $25,000. Knapp & Bosworth, Odd Fellows Bldg., Archt.

SOUTHERN STATES

La., New Orleans—The Go Ro Co., Inc., 826 Baronne St., plans to build a 1 story, 110 x 328 ft. factory, for the manufacture of automatic gas-water heaters. Estimated cost, $75,000. N. G. Goriou, 826 Baronne St., Archt.

MIDDLE WEST

Ill., Chicago—M. Espert, 236 North Clark St., has awarded the contract for the construction of a 2 story, 100 x 100 ft. garage, on Cass St. and Grand Ave. Estimated cost, $65,000.

Ill., Chicago—The Johnson Fare Box Co., 236 South Robey St., has awarded the contract for the construction of a 3 story, 120 x 165 ft. factory, on Ravenwood and Leland Aves. Estimated cost, $125,000.

Ill., Chicago—The Natl. Tea Co., 2715 West North Ave., has awarded the contract for the construction of a 1 story, 100 x 140 ft. garage, on Larrabee and Hobbie Sts. Estimated cost, $70,000.

Ill., Chicago—The Steel Sales Corp., 129 South Jefferson St. plans to build a 1 story, 400 x 600 ft. steel fabrication plant on Crawford Ave. and 35th St. Estimated cost, $250,000.

Ill., Chicago—F. H. Winston, 749 North Michigan Ave., has awarded the contract for the construction of a 1 and 2 story, 50 x 200 ft. automobile sales and service station, on Sheridan Rd. and Irving Park Blvd. Estimated cost, $100,000.

Ill., Moline—Williams White & Co., 3rd Ave. and 8th St., manufacturer of machinery, has awarded the contract for the construction of a 1 story, 110 x 325 ft. foundry, on 43rd St., between 3rd and 4th Aves.

Ill., Pullman (Chicago P. O.)—The Pullman Co., 79 East Adams St., manufacturer of railroad cars, has awarded the contract for the construction of a 1 story 45 x 160 ft. and 60 x 170 ft. factory, on 164th St. and Erickson Ave. Estimated cost, $176,000.

Ill., Rock Island—The Rock Island Register Co., 25th St. and 5th Ave., has awarded the contract for the construction of a 4 story, 73 x 115 ft. factory. Estimated cost, $70,000.

Mich., Detroit—The Deford Motor Co., 817 Cass Ave., will soon award the contract for the construction of a 2 story, 60 x 100 ft. service station, on 2nd Ave. Estimated cost, $30,000. H. H. Lane, 2320 Dime Bank Bldg., Archt.

Mich., Detroit—The C. M. Hall Lamp Co., Hancock and Rivard Sts., manufacturers of motor car lamps, will soon award the contract for the construction of a 2 story, 100 x 172 ft. factory and office building, on Hancock Ave. Estimated cost, $170,000. A. Kahn, Marquette Bldg., Archt.

Mich., Kalamazoo—Moulton & Dalgleisch, West Main St., are having plans prepared by C. A. Fairchild & Sons, Archts., 150 South Burdick St., for the construction of a 2 story, 70 x 100 ft. sales and service station.

Mich., Marysville—The Genl. Aluminum and Brass Co., Boulevard and St. Aubin Sts., Detroit, will soon award the contract for the construction of a 1 story, 380 x 420 ft. foundry, on Michigan Ave. and Cuttle Rd. Estimated cost, $500,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, Archts. and Engrs.

Mich., Rochester—The Rochester Machine and Foundry Co. will build a 1 story, 60 x 128 ft. foundry. Estimated cost, $20,000.

O., Canton—T. C. Smith is having plans prepared by Albrecht, Wilhelm & Kelly, Archts., Union Bldg., Cleveland, for the construction of a 1 story, 66 x 200 ft. garage, on East 4th St. Estimated cost, $50,000.

O., Cincinnati—The Davis Welding Co., 1543 Queen City Ave., plans to build a factory, on Borden St. Estimated cost, $150,000.

O., Cincinnati—The K. Kiefer Machine Co., Martin St., is having plans prepared by Elzner & Anderson, Archts., Citizens Bank Bldg., for the construction of a 2 story, 50 x 150 ft. factory.

O., Cincinnati—The Warner Elevator Co., Spring Grove Ave., will soon award the contract for the construction of a 1 story, 40 x 175 ft. factory.

O., Cleveland—The Amer. Scrap Metal Co., 2681 East 40th St., has awarded the contract for the construction of a 1 story, 40 x 120 ft. factory and storage house, at 9108 Woodland Ave. Estimated cost, $25,000.

O., Cleveland—The Brown Body Corp., 3147 Superior Ave., has awarded the contract for the construction of a 1 and 3 story, 100 x 170 ft. and 60 x 170 x 260 ft. factories, on West 90th St. and Maywood Ave. Estimated cost, $500,000.

O., Cleveland—The Champion Forge and Machine Co., East 71st St. and Union Ave., has awarded the contract for the construction of a 3 story, 60 x 120 ft. addition to its factory. Estimated cost, $100,000.

O., Cleveland—The Champion Machine and Forge Co., 3695 East 78th St., has awarded the contract for the construction of a 1 story, 80 x 240 ft. forge shop, at 3725 East 78th St. Estimated cost, $75,000.

O., Cleveland—The Cleveland Automobile Co., East 131st St., is having plans prepared by E. McGeorge, Archt. and Engr., 1900 Euclid Ave., for the construction of a 2 story, 80 x 240 ft. factory and a 1 story, 80 x 80 ft. heat treating plant, on London Rd. Total estimated cost, $210,000.

O., Cleveland—The Cleveland Steel Barrel Co., 9612 Meech Ave., will soon award the contract for the construction of a 1 story, 60 x 120 ft. factory. Estimated cost, $60,000. Christian, Schwarzenberg & Gaede, 1900 Euclid Ave., Archts. and Engrs.

O., Cleveland—The Creswell Realty Co., Union Bldg., has awarded the contract for the construction of an 8 story, 100 x 125 ft. garage, on Huron Rd. and East 12th St. Estimated cost, $500,000. Noted Feb. 19.

O., Cleveland—P. F. Foster, 1407 East 40th St., has awarded the contract for the construction of a 1 story, 47 x 50 ft. machine shop, at 1573 East 21st St. Estimated cost, $10,000.

O., Cleveland—J. Kronenberger, 3737 West 25th St., has awarded the contract for the construction of a 1 story, 74 x 86 ft. garage and commercial building. Estimated cost, $50,000.

O., Cleveland—The Standard Wire and Spring Co., 5915 Bonna Ave., has awarded the contract for the construction of a 2 story, 90 x 145 ft. factory, on 39th St. and Superior Ave. Estimated cost, $100,000.

O., Cleveland—W. S. Tyler Co., East 36th St. and Superior Ave., manufacturer of ornamental iron, has awarded the contract for the construction of a 1 story, 83 x 132 ft. wire weaving factory, at 1395 East 34th St. Estimated cost, $50,000.

O., Cleveland—The West Steel Castings Co., 811 East 70th St., has awarded the contract for the construction of a 1 story, 100 x 150 ft. foundry. Estimated cost, $75,000. R. H. West, Pres.

O., Cleveland—The Windsor Constr. Co., Swetland Bldg., plans to build a garage, on Summer Ave. Estimated cost, $100,000.

O., Columbus—C. L. McKee, 52 East Lay St., has had plans prepared by C. W. Bellows, Archt., 69 Ruggerby Bldg., for the construction of a 2 story, 47 x 180 ft. service station, on North 4th St. Estimated cost, $50,000.

O., Dayton—The Natl. Automobile Sales Co., 127 East 4th St., plans to build a 3 story, 50 x 180 ft. garage and automobile sales station, at 117 North St. Clair St. Estimated cost, $75,000. S. Ablon, Pres.

O., Hamilton—Hamilton Lodge Knights of Pythias, is having plans prepared for the construction of a 3 story garage, on Main St. Estimated cost, $50,000.

WEST OF THE MISSISSIPPI

Ia., Cushing—Bd. Educ. plans to build a 2 story school, to include a manual training department. Estimated cost, $80,000. W. E. Hulse Co., Inc., 210 Masonic Temple, Des Moines, Ia., Archts.

Ia., Newton—The Chicago, Rock Island & Pacific R.R. Co., La Salle St. Sta., Chicago, Ill., is having plans prepared for the construction of a 1 story, 50 x 200 ft. round house, here. Estimated cost, $50,000.

Kan., Rosedale—The Cleveland Steel Barrel Co., 9612 Meech Ave., Cleveland, O., will build a 1 story, 80 x 290 ft. and a 2 story, 45 x 80 ft. factory, at 630 Blod St. Estimated cost, $80,000. Brostrom & Drotts, 400 Reliance Bldg., Kansas City, Mo., Archts.

Kan., Topeka—The Trefry Motor Co., 1014 Kansas Ave., will soon award the contract for the construction of a 2 story, 75 x 150 ft. garage. Estimated cost, $100,000. W. E. Glover, Archt.

Minn., Blooming Prairie—Bd. Educ. will soon award the construction of a 2 story 80 x 120 ft. high school building, to include a manual training department. Estimated cost, $150,000. F. Tustison, Auditorium Bldg., Minneapolis, Engr.

Minn., Hancock—Bd. Educ. plans to build a 2 story high school, to include a manual training department. Estimated cost, $100,000. S. Jacobson, 403 Endicott Bldg., St. Paul, Archt. A. A. Robert's, Clk.

Minn., Minneapolis—The Red River Lumber Co., 807 Hennepin Ave., has awarded the contract for the construction of a 2 story, 100 x 135 ft. garage, on Franklin and Lyndale Aves. Estimated cost, $50,000. Noted Dec. 25.

Mo., St. Louis—The Dorris Motors Corp., Sarah and Laclede Sts., has had plans prepared by The Wiedmer Eng. Co., Archts., Syndicate Trust Bldg., for the construction of a 3 story, 180 x 200 ft. factory, on Forest Park Ave. and Sarah St. Estimated cost, $350,000.

Mo., St. Louis—The Lahmann Machine Co., 606 South Broadway, will soon award the contract for the construction of a 2 story, 110 x 195 ft. factory, on LaSalle and Grand Sts. Estimated cost, $450,000.

Mo., St. Louis—The Traffic Motor Truck Co., 5200 North 2nd St., has awarded the contract for the construction of a 1 story, 100 x 145 ft. factory, at 5303 North 2nd St. Estimated cost, $25,000.

N. D., Fargo—The Public Service Garage Co. will soon award the contract for the construction of a 2 story, 140 x 200 ft. garage. Estimated cost, $125,000. Braseth & Rosatti, 105 Broadway, Archts.

N. D., Fargo—J. C. Vincent will soon award the contract for the construction of a 4 story garage, on 3rd Ave. Estimated cost, $80,000. Kurke & Keith, Equity Bldg., Archt.

Okla., Shawnee—City plans to remodel fire fighting apparatus also build a repair shop for the Fire Department. Estimated cost, $100,000.

Tex., Austin—The Ford Agency, 509-11 Colorado St., has awarded the contract for the construction of a 2 story, 120 x 140 ft. garage, on Franklin and Pearl Sts. Estimated cost, $80,000.

WESTERN STATES

Cal., Dinuba—Bd. Educ. plans to build a 2 story high school, to include a manual training and domestic science department. Estimated cost, $100,000.

Cal., Los Angeles—The Grand Central Garage Co., 6th and Olive Sts., is having plans prepared by Stanton, Reed & Hibbard, Engrs., 622 Metropolitan Bldg., for the construction of an 8 story, 168 x 180 ft. garage, on 5th St. and Grand Ave. Estimated cost, $400,000.

Cal., San Francisco—L. Lewin, 907 Rialto Bldg., has awarded the contract for the construction of a 3 story automobile service station, on Jackson St. and Van Ness Ave. Estimated cost, $60,000.

Nev., Reno—Nevada Highway Dept., Carson City, has purchased a 4 acre site, in the eastern part of Reno and plans to build extensive machine and repair shops for highway equipment employed on construction throughout the state. Estimated cost, $30,000. C. C. Cottrell, Engr.

Ore., Grants Pass—H. Smith plans to build a 1 story, 100 x 100 ft. garage, on H. and 5th Sts. Estimated cost, $50,000.

Wash., Kelso—E. L. Stoneson and associates plan to build a 1 story factory, adjoining the C. A. Taylor Lumber plant, to have a daily capacity of 60,000 lathes. Estimated cost, $10,000.

CANADA

Ont., Brockville—Machineries and Foundries, Ltd., plan to build a foundry, in the eastern part of the town. Estimated cost, $150,000.

General Manufacturing

NEW ENGLAND STATES

Conn., Norwalk — Rosenwald Wimpfheimer, Inc., South Norwalk, is having plans prepared by Sunderland & Watson, Archts., 248 Main St., Danbury, for the construction of a factory, on Cross St., for the manufacture of hats.

Conn., Thamesville (Norwich P. O.)—The Winchester Woolen Mills plans to build a 1 story, 40 x 200 ft. addition to its plant. Estimated cost, $35,000.

Conn., Windsor Locks—The J. R. Montgomery Co. plans to build a 6 story, 62 x 65 ft. addition to its plant, for the manufacture of cotton goods. Estimated cost, $75,000. Ford, Buck & Sheldon, Inc., 60 Prospect St., Hartford, Engrs.

Me., Waterville—The Waterville Mfg. Co. plans to build a 1 and 2 story, 80 x 300 ft. factory, for the manufacture of small household articles. Estimated cost, $125,000. Green & Wilson, 74 Main St., Archts.

Mass., Boston—The Rush Printing Co., 21 Bromfield St., will soon award the contract for the construction of a 3 story, 30 x 70 ft. printing plant, on Massachusetts Ave. Estimated cost, $25,000. W. J. Mastrangelo, 2 North Sq., Engr. and Archt.

Mass., Brockton—The G. E. Keith Co., 23 Station Rd., will soon award the contract for the construction of a 4 story, 60 x 400 ft. factory, for the manufacture of shoes. Estimated cost, $350,000. Jenks & Ballou, 1035 Grosvenor Bldg., Providence, R. I., Engrs.

Mass., Chicopee—The Dwight Mfg. Co., Front St., has awarded the contract for the construction of a 5 story, 72 x 314 ft. factory for the manufacture of cotton goods. Estimated cost, $500,000.

Mass., Gardner—Nicholas & Stone Co., Logan St., manufacturers of chairs, has awarded the contract for the construction of a 3 story, 90 x 150 ft. factory. Estimated cost, $80,000.

Mass., Holyoke—The W. Skinner Sons Co., 208 Appleton St., has awarded the contract for the construction of a 1 story, 60 x 260 ft. factory, on Dwight St., for the manufacture of silks. Estimated cost, $35,000.

Mass., Hyde Park (Boston P. O.)—The Kapo Mfg. Co., 188 Providence St., manufacturer of life saving garments, will build a 2 story 132 x 140 ft. addition to its factory. Estimated cost, $70,000.

Mass., Roxbury (Boston P. O.) — L. Garber, c/o Tuck & Gilman, Archts., 34 School St., Boston, will soon award the contract for the construction of a 3 story, 42 x 51 ft. bottling plant, on Blue Hill Ave. Estimated cost, $38,000.

Mass., Worcester — The Simplex Player Action Co., 10 Blackstone St., manufacturer of player pianos, has awarded the contract for the construction of a 5 story, 80 x 150 ft. factory, on Summer and Charles Sts. Estimated cost, $150,000.

N. H., Goffstown—The United States Bobbin and Shuttle Co. has awarded the contract for the construction of a 3 story, 50 x 100 ft. factory. Estimated cost, $50,000.

N. H., Somersworth—The Great Falls Mfg. Co., 261 Main St., is having plans prepared by Lockwood, Greene & Co., Engrs., 60 Federal St., Boston, for the construction of a 4 story, 144 x 1850 ft. mill, for the manufacture of cotton goods. Estimated cost, $4,500,000.

R. I., Warren—The Mt. Hope Spinning Mills will soon award the contract for the construction of a 2 story, 110 x 200 ft. addition to its mill, on Cutlee St. Estimated cost, $100,000. Jenks & Ballou, 1035 Grosvenor Bldg., Providence, Archt.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Falconer Co., Gay and Water Sts., has awarded the contract for the construction of an 8 story, 45 x 150 ft. addition to its printing plant. Estimated cost, $100,000. Noted Feb. 12.

N. J., Jersey City — The Continental Candy Co. has awarded the contract for the construction of an 8 story factory. Estimated cost, $300,000.

N. Y., Medina—H. J. Heinz Co., 1062 Main St., Pittsburgh, Pa., plans to build a 2 story, 171 x 275 ft. bottling plant, here. Estimated cost, between $90,000 and $100,000.

N. Y., New York (Borough of Brooklyn)—The Hudson Bag Co., 77 Washington St., manufacturer of paper bags, will build a 2 story, 200 x 265 ft. factory and warehouse, on Bogert, Scholes and Meserole St. Estimated cost, $30,000.

N. Y., New York (Borough of Manhattan)—The Natl. Gum and Mica Co., 12 West End Ave., will build a 25 x 100 ft. addition to its factory.

N. Y., Syracuse—The Onondaga Milk Producers Association has awarded the contract for the construction of a 40 x 100 x 100 ft. dairy, at 806 Burnet Ave. Estimated cost, $150,000.

Pa., Collingdale—The Jobson Chocolate Co., c/o Day & Zimmerman, Engrs. and Archts., 611 Chestnut St., Philadelphia, plans to build a 1 story, 25 x 60 ft. factory, for the manufacture of chocolate. Estimated cost, $10,000.

Pa., Kingston (Wilkes-Barre P. O.)—The Crane Silk Co., 416 West Elm St, has awarded the contract for the construction of a 2 story, 80 x 100 ft. silk mill. Estimated cost, $55,000.

Pa., Lemoyne—The Pennsylvania Concrete Tile Roofing and Cement Products Co. plans to build a 1 story, 40 x 100 ft. factory, for the manufacture of cement products. Estimated cost $6,000.

Pa., Lock Haven—The Castenea Paper Co. has awarded the contract for the construction of a 2 story, 425 x 515 ft. mill and a 1 story 60 x 150 ft. storehouse. Estimated cost, $1,250,000. G. F. Hardy, Engr.

Pa. Philadelphia—Bergmer & Engel, 32nd and Master Sts., has awarded the contract for alterations to its brewery. Estimated cost, $15,000.

Pa., Philadelphia—The Model Mills Co., Ontario and 9th Sts., has awarded the contract for the construction of a 4 story, 60 x 160 ft. factory. Estimated cost, $150,000.

SOUTHERN STATES

Ga., Atlanta — The Corrugated Paper Products Co., Inc., c/o L. J. Rosenberg, Vice Pres., Majestic Hotel, has awarded the contract for the construction of a 2 story, 150 x 185 ft. factory, on Stephens St. Estimated cost, $60,000.

Ga., Atlanta—Montag Bros., 10 Nelson St., has awarded the contract for the construction of an 80 x 165 ft. box factory, on Marrietta St. Estimated cost, $200,000.

Ga., West Point — The Larret Cotton Mills plan to build a 1 story, 80 x 300 ft. mill. J. E. Sirrine, Greenville, S. C., Archt.

La., Ruston—The Russell Petroleum Co. plans to build a refinery, to have 1,200 barrel capacity. Estimated cost, $120,000.

MIDDLE WEST

Ill., Chicago—The Columbian Colortype Co., 2141 Calumet Ave., will soon award the contract for the construction of a 7 story, 120 x 175 ft. printing plant, on 21st St and Calumet Ave. Estimated cost, $650,000. A. S. Alschuler, 28 East Jackson St., Archt. Noted Feb. 19.

Ill., Chicago—The Matchless Metal Polish Co., 840 West 49th Pl., will soon award the contract for the construction of a 2 story, 100 x 125 ft. factory, on 49th Pl. and Halsted St. Estimated cost, $75,000. A. G. Lund, 453 West 63rd St., Archt.

Ill., Waukegan—The H. W. Johns-Manville Co., 201 Clybourn St., Milwaukee, manufacturer of asbestos, has awarded the contract for the construction of a plant, to include several buildings. Estimated cost, between $5,000,000 and $6,000,000.

Ind., Evansville—The Liquid Carbonic Co., Heidelback Ave. and Indiana St., is having plans prepared by C. Shopbell & Co. Archts., for the construction of a 2 story, 80 x 150 ft. factory. Estimated cost, $50,000.

Ind., Kokomo — The Pittsburgh Plate Glass Co., Valie Ave., has awarded the contract for the construction of an addition of several new buildings to its plant. Estimated cost, $2,000,000.

Mich., Detroit—The C. F. Smith Co., West Grand Blvd., has awarded the contract for the construction of a 2 story, 66 x 70 ft. factory building, to include a bakery. Estimated cost, $40,000.

O., Barberton—The Diamond Match Co., 2nd St. and Robertson Ave., has awarded the contract for the construction of a 4 story, 125 x 175 ft. factory. Estimated cost, $475,000.

O., Cincinnati—F. E. Bullerdick, Dempsey St., manufacturer of mattresses and feather products, has awarded the contract for the construction of a 2 story, 100 x 150 ft. factory, on Hopple St. Estimated cost, $100,000.

O., Cleveland—The Aetna Rubber Co., 815 East 79th St., plans to build a 1 or 2 story, 100 x 130 ft. factory. Estimated cost, $100,000. H. Kappler, Mgr.

O., Cleveland—The Beckman Co., 3167 Fulton Rd., manufacturer of blankets, plans to build a 2 story, 200 x 200 ft. weaving factory, on Fulton Rd. and West 33rd St. Estimated cost, $40,000. Lockwood, Greene & Co., Bangor Bldg., Engrs. and Archts.

O., Cleveland—The Eilert Beverage Co., 2539 Lorain Ave., has awarded the contract for the construction of a 2 story addition to its bottling plant, on Sackett Ave. Estimated cost, $60,000. H. F. Eilert, Pres. Noted Feb. 26.

O., Cleveland—The Krause Winograd Co., Bangor Bldg., has awarded the contract for the construction of a 3 story, 42 x 68 ft. factory, at 4021 Broadway, for the manufacture of furniture. Estimated cost, $50,000.

O., Cleveland—The Ohio Cut Stone Co., Citizens Bldg., has awarded the contract for the construction of a 1 story, 84 x 160 ft. cut stone plant, at 2066 Random Rd. Estimated cost, $27,000.

O., Cleveland—The Wilberite Roofing Co., 3327 Broadview Rd., has awarded the contract for the construction of a 1 story, 40 x 300 ft. and 40 x 100 ft. addition to its factory, on Brook Park Rd. Estimated cost, $75,000.

O., Columbus—The Climax Rubber Co., Citizens Bank Bldg., is having plans prepared for the construction of a 3 story, 100 x 300 ft. factory.

O., Columbus—The Felber Biscuit Co., McCoy and Grant Aves., has awarded the contract for the construction of a 6 story, 62 x 100 ft. factory. Estimated cost, $150,000.

O., Dayton—The Allsteel Ridewell Tire and Rubber Co., Lindsey Bldg., has awarded the contract for the construction of a 3 story factory. Estimated cost, $100,000.

Wis., Oostburg—The Dutch Canning Co. has purchased a site and plans to build a 4 story, 50 x 70 ft. factory, on Main St. Estimated cost, $30,000.

WEST OF THE MISSISSIPPI

Mo., St. Louis—The H. D. Lee Mercantile Co., 410 North 18th St., plans to build a factory, for the manufacture of overalls. Estimated cost, $150,000. L. Klasky, Mgr.

Mo., St. Louis—The Mississippi Glass Co., 4070 North 1st St., has awarded the contract for the construction of a 1 story, 83 x 104 ft. factory, at 83-91 Angelica St. Estimated cost, $26,000.

N. D., Grand Forks—The Industrial Comn. of North Dakota, Bismarck, will soon award the contract for the construction of a flour mill, to have 2,000 to 3,000 bbls. daily capacity, and an 8 story, 40 x 160 ft. office building. Estimated cost, $1,500,000. The G. L. Pillsbury Co., Metropolitan Life Bldg., Minneapolis, Archts.

Okla., Claremore—E. B. Rankin, 508 South Division St., Sapulpa, plans to build a refinery here, to have 1,500 bbls. capacity. Estimated cost, $150,000.

Tex., Houston—The Japanese Cotton Trading Co., Grain and Cotton Exchange Bldg., Ft. Worth, has awarded the contract for the construction of a 1 story, 310 x 750 ft. cotton compressor and warehouse, along the tracks of the Houston Belt R.R. Estimated cost, $200,000. Noted March 4.

Tex., Houston—The Magnolia Petroleum Co., Mason Bldg., will soon award the contract or the construction of a 2 story, 60 x 100 ft. filling station, on McKinney and Fannin Sts. Estimated cost, $150,000. A. C. Finn, 201 Foster Bldg., Archt.

WESTERN STATES

Cal., Banning—The Twin Cities Gas Co., recently organized by The Union Natl. Bank, Pasadena, has been granted a franchise to rebuild and enlarge its old gas plant and distributing system. Estimated cost, $27,500. M. Berkley, Hollingsworth Bldg., Los Angeles, Engr.

Cal., Long Beach—The Toasted Products Co. recently organized with $100,000 capital stock by J. A. Rominger, 116 Locust Ave., and others, plans to build a poultry and stock food factory, on Harbor Channel No. 2. Estimated cost, $70,000.

Cal., Los Angeles—The Southern Pacific R.R., 65 Market St., San Francisco, has awarded the contract for the construction of a 1 story, 163 x 173 ft. coach paint shop, to be erected at the railroad, here. Estimated cost, $60,000.

Cal., Oakland—The Palmolive Co., 42 4th St., Milwaukee, plans to build a factory, for the manufacture of soaps. Estimated cost, $400,000.

Cal., Torrance—The Torrance Packing Co. is having plans prepared by E. E. Horstman, Archt., Torrance, for the construction of a 1 story, 90 x 200 ft. packing house. Estimated cost, $50,000.

Cal., Ukiah—The California Grape Products Co. plans to build a factory, for the manufacture of grape juice, jelly, etc. Estimated cost, $100,000.

Cal., Ventura—The Shell Oil Co. plans to build a refinery. Estimated cost, $60,000.

Cal., Yreka—W. Ensle plans to build a 1 story sawmill, to have 40,000 ft. daily capacity, near Mt. Vernon Mine, on Green Horn Creek. Estimated cost, $15,000.

Ore., Elgin—Adams Bros. plan to build a 1 story, saw mill to have 40,000 ft. daily capacity. Estimated cost, $20,000.

Ore., Eugene—The Mutual Creamery Co., 551 West 3rd St., S., plans to build a 2 story creamery, to have 25,200 sq.ft. of floor space. Estimated cost, $100,000. J. H. Schack, Libby Bldg., Seattle, Wash., Archt.

Ore., Forest Grove—A. Randles, Portland, plans to build a 1 story factory, for the manufacture of brick and tile. Estimated cost, $5,000.

Ore., Hillsboro—Ray & Son, Sherlock Bldg., Portland, has awarded the contract for the construction of a 1 story, 86 x 370 ft. cannery, here. Estimated cost, between $55,000 and $60,000.

Ore., Portland—The Bergman Shoe Mfg. Co., 761 Thurman St., will soon award the contract for the construction of a 3 story, 60 x 100 ft. shoe factory, on 18th and Thurman Sts. Estimated cost, $50,000. Claussen & Claussen, Macleay Bldg., Archts.

Ore., Salem—The Spaulding Logging Co., Oregonian Bldg., plans to build a 1 story addition to its factory, to have a daily capacity of 20,000 ft. Estimated cost, $10,000.

Wash., Entiat—The Entiat Fruit Grower's League plans to build a 4 story, 110 x 210 ft. fruit warehouse and packing plant. Estimated cost, $50,000. G. H. Keith, Hutton Bldg., Spokane, Archt.

Wash., Kelso—J. W. Butterworth has purchased the T. K. Guntley cedar tract and the Johnson saw mill, on Owl Creek, and plans to build a 1 story addition to same. Estimated cost, $10,000.

Wash., Kelso—The Thompson Ford Lumber Co. plans to rebuild its plant, which was recently destroyed by fire. Estimated cost, $20,000.

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